Уральский федеральный университет
имени первого Президента России Б.Н.Ельцина
Высшая школа экономики и менеджмента

ЭЛЕКТРОННЫЙ БИЗНЕС. ЧАСТЬ 2

ELECTRONIC BUSINESS. 2ND PART

Учебное пособие

Министерство образования и науки Российской Федерации
Уральский федеральный университет
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Учебное пособие посвящено трем основным аспектам электронного бизнеса: «Электронные финансы», «Электронное правительство» и «Разработка веб-приложения для электронного бизнеса».
Модуль «Электронные финансы» дает знания о теоретических и практических аспектах развития электронных финансовых услуг, онлайн-торговли ценными бумагами и валютой, об электронном банкинге, интернет-страховании, безопасности и защите интернет-банкинга. Модуль «Электронное правительство» освещает области веб-технологий, их применения в государственном управлении, а также разработки и управления проектами. Модуль «Разработка веб-приложений для электронного бизнеса» посвящен техническим вопросам создания веб-приложений. В частности, обсуждаются вопросы разработки пользовательского интерфейса, создания навигации веб-приложений, верстки веб-страниц, работы с базами данных в веб-приложениях.
Учебное пособие предназначено для студентов экономических специальностей.

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INTRODUCTION

The course "Electronic Business. 2nd Part" is devoted to three important directions in the field of e-business: "E-Finance", "E-government" and "Development of web applications for e-business". The material is structurally divided into chapters and subchapters, at the end of each chapter there are literature and Internet sources, as well as self-study questions.

Electronic finance is closely linked with the application of modern information and communication technologies in the financial area. The advantages of Internet-based technologies significantly change the nature and structure of the financial services and allow both traditional and new providers to offer users an effective way of working with them.

Issues related to e-government, cover theoretical and practical aspects of communication Consumer electronic means with state and municipal administration.

The module "E-Finance" provides knowledge about the theoretical and practical aspects of the development of electronic financial services, online trade of securities and currencies, electronic banking, online insurance, security and protection of Internet banking.

The module "E-government" provides knowledge in the field of web technologies and their application in public administration, as well as the development and project management in public administration.

The module "Development of web application for e-business" covers the technical issues of creating of web applications. In particular, it discusses issues of development of user interface, creating navigation of web application, layout of web pages, working with databases and web applications.

The textbook is intended for students of economic specialties of higher educational.

1. E-FINANCE

1.1. Online trading

By online trading we mean online trade in securities and currencies, i. e. placing orders and closing transactions for buying and selling securities or currency using Internet-based platforms that have been provided to consumers by intermediaries — traditional or electronic brokers (e-brokers).

1.1.1. Participants and functions of online trading

Participation of consumers in the trade of securities and currencies in the global capital markets is carried out through the intermediacy of brokers, which according to the terminology adopted by Bulgarian market are called investment intermediaries. Banks can also act as intermediaries in this market. In order to place an order for buying or selling securities or currencies, clients make use of brokers over the counter, in their branch network, or through web-based platforms available on their sites — an opportunity that is the result of the advance of innovative electronic business in the financial sphere.

Traditional brokerage companies with physically existing branch network (brick branches) can be related to two categories of broker:

- *Classical brokers*, called "full service brokers" — they provide the full range of services: consulting clients in making investment decisions and legal service, maintaining a client trading account, accepting and executing orders for buying and selling securities, perhaps investment portfolio management, etc.
- *Discount brokers* — their major activity is intermediacy in executing individual investors' orders, whereby they mainly serve those clients, who make their own investment decisions (self directed). Discount brokers

provide a limited range of consultancy. Their market presence is relatively high because of the lower commission rate they charge.

In the days before the Internet investors had to communicate with their stockbroker from traditional brokerage companies mostly over the telephone. The brokerage company entered the order in their system, which was connected to the stock trading systems. In 1994 K. Aufhauser & Company, Inc (later acquired by what is today the second biggest US online broker TD Ameritrade) became the first brokerage company to provide online trading [1]. Since then, investing online has been manifesting continuous growth. Investors can already enter orders for direct buying and selling securities online, with these orders passing through brokers and allowing them to monitor or approve the transactions. Thus the client and the brokerage company are protected against illegal or incorrectly executed transactions, which could unfavorably impact the client's portfolio or the broker's license. When using the intermediacy of an online broker clients use its e-trading platform. One of the most important characteristics of the intermediacy of online brokers is the huge reduction of expenses that clients pay for brokers' services — their commissions fall dozens of times compared to those of traditional brokers.

Functions of online brokerage [2] comprise providing information about security prices and the financial state of the companies, whose securities are being traded; management of trading accounts; providing tools for real-time tracking and monitoring of security quotations and indexes for the purposes of portfolio management; providing the latest news, in-depth analyses and reports; execution of orders for security buying and selling; settlement of securities at the stock exchange and other. For its services the online broker earns a commission or a fee that is considerably lower than that of traditional brokers.

Online trading in various types of securities (shares, bonds, options, mutual funds, etc.) and currencies is offered to investors on the Internet by two basic types of broker [3]:

- *Traditional brokers (classical and discount ones) and banks*, in the past offering intermediacy only offline, through their branch network and at present marked as brick and click brokers. Examples of such bro-

[1] About TD Ameritrade [Electronic resource]. URL: https://www.tdameritrade.com/about-us.page (date of access: 18.04.2013).

[2] The English term for the provision of electronic brokerage services is online- or e-brokerage and e-broking.

[3] Sahut J.-M. On-line Brokerage in Europe: Actors & Strategies // JIBC. 2003. Vol. 8. No. 1.

kers include Merrill Lynch [4], Charles Schwab, Ferri, Dubus, Financière Warny, BNP-Paribas, Bred and other, including derivatives of traditional investment companies (Fidelity).

- *New electronic brokers*, also known as online or e-brokers, that emerged especially for the purpose, and exist online, as well as some of the direct Internet banks, offering investment services. Representatives of this type of broker are the US E*TRADE, Scottrade, TD Ameritrade; Cortal Consors (Germany); Avanza (Sweden); the Dutch online bank BinckBank N. V. and other.

The place of electronic brokers from the viewpoint of the above mentioned traditional categorization of brokerage companies is predominantly in the discount brokers segment.

Consumers' participation in online trading definitely depends on their possession of certain financial knowledge in view of the need for making investment decisions. Unlike Internet banking, which does not pose any requirement whatsoever for the client using interactive banking services, participation in stock exchange trade is based on the respective financial literacy necessary to do that. To a certain extent this fact is an obstacle for growing penetration of online investing among consumers.

Depending on their behavior in stock trading and their attitude to the use of Internet in stock trading, consumers are divided into three groups according to a publication of JP Morgan [5]: *participating on their own* (self directed), who manage their finances themselves and are focused on application of the global network; *partially participating*, who seek the advice of consultants on certain issues, delegate some decisions to consultants and do not fully use Internet solutions, and those fully *delegating* their financial affairs to professional advisors and consultants, with no particular attitude towards the opportunities of online trading.

1.1.2. Advantages of online brokerage

Online brokerage brings participants — both clients and brokers, the advantages mainly associated with prices and the conveniences provided. There is considerable cost-cutting for every transaction performed. While in the past small investors gained access to trading in the capital markets mainly through the intermediacy of large investment banks for considerable commission, owing to online broking, they now have a substantially cheaper access: comparisons show that costs per transaction per consumer in conventional intermedi-

[4] Since 2008 is a subsidiary of Bank of America.

[5] Morgan J. P. Online Finance Europe. Securities Ltd., 2000. P. 26.

acy, for example that of Merrill Lynch as a broker, amount to around $373 and only $8 when using the services of the online broker Ameritrade [6], while online brokerage services of Consorsbank, owned by BNP Pariba, charge a commission for new clients of €4.95 per transaction for volumes above €10 000 [7]. Costs per unit of transaction performed on the Internet are 25 times as low as those for an over-the-counter transaction in an office [8]. These days trading demands less participation on the part of employees who service it; marginal costs for closing additional transactions are low; the new electronic brokers entering the market results in increased competition with traditional brokerage firms, which leads to greater effectiveness of their activity.

Another advantage of online trading is improving the speed of the transaction closing and settlement, as there is no need for paper-based documents to be digitized, processed and archived.

Electronic brokering facilitates the wider scope of development of the so called "day trading", a specialized type of investing, where investors make a profit by buying or selling securities or currency pairs, that is, they open and close short-term market positions — mostly within a day (a session). This trading is usually speculative in character and is tyFigal mainly for US capital markets. According to an analysis of the ECB's made in 2001, the day trading is not a significant phenomenon in Europe as it is in the US, where in the middle of 2001 there were 10 000 active investors of this type [9].

1.1.3. Development and state of e-brokering

In the evolution of e-brokering we observe an extensive period of development during the mid-1990s (1996–2000), which reaches a peak in 1999–2000. Throughout this period masses of clients turned to using online brokerage services. Consequently, traditional brokers and banks successfully joined the online market in basically two ways — by creating their own e-business model or by merging with an existing electronic broker [10]. Owing to the global network this period reports a boom in the number of new players on the market for intermediaries — in the USA, companies offering brokerage ser-

[6] Coorey M. Internet broking: Europe's turn to get wired // Global Finance. 1999. Nov.

[7] Consorsbank [Electronic resource]. URL: https://www.consorsbank.de/ev/Wertpapierhandel/Depot-Software/Trader-Konto (date of access: 22.03.2015).

[8] Sahut J.-M. On-line Brokerage in Europe: Actors & Strategies // JIBC. 2003. Vol. 8. No. 1.

[9] European Central Bank // The Euro Equity Markets. 2001. Aug. P. 43.

[10] Sahut J.-M. On-line Brokerage in Europe: Actors & Strategies // JIBC. 2003. Vol. 8. No. 1.

vices grew to over 100 from 35 in 1997 [11]. Despite the initial resistance, nearly every major investment intermediary offers consumers online trading from the home or office.

According to JP Morgan's estimates within 4 years (1997–2000) the number of clients using electronic brokering services in the Eurozone rose ten times to reach 3 m people [12].

A suitable indicator for assessing the development of online trading is also the number of security trading accounts opened. In the middle of 2001, in Germany there were 2 141 000 online accounts or about 50 % of all trading accounts in Europe, and, according to statistics, the German market holds the leading position in this field, followed by the Swedish one with 11 % market share [13]. In the same year 13.2 m Americans bought or sold securities online, and 43 % of American households that have trading accounts, trade online [14].

A survey on the use of Internet for researching capital market and buying shares was carried out in 2006 by the leading German bank Deutsche Bank among consumers from 7 European countries [15]. Data shows that the Swedish manifest the strongest interest in getting information online about stock market quotations and financial news about companies (slightly less than 10 % of consumers), then the Dutch and the Germans (about 6 %), followed by the British (about 3.8 %) and the French. Again Swedish consumers (by about 4 %) are the respective leaders regarding purchase of shares, followed by the Germans with less than 2 %.

Potential users of the online distribution channel are the owners of stocks, whose average share for the 7 countries researched is slightly over 20 % of the population according to data from 2006. This share varies for particular countries, with Swedish and British investors scoring the highest: ≈ 35 and 30 % respectively, and the shares of stockholders from Germany, Italy and Spain are below the average. In comparison: according to J. P. Morgan's data, at the end of 1998 only 12 % of the adult population of Europe owned stocks, that is, the trend is for a growth of investors in securities, and consequently, the consumers of online trading.

[11] Coorey M. Internet broking: Europe's turn to get wired // Global Finance. 1999. Nov.

[12] European Central Bank // The Euro Equity Markets. 2001. Aug. P. 43.

[13] Sahut J.-M. On-line Brokerage in Europe: Actors & Strategies // JIBC. 2003. Vol. 8. No. 1.

[14] Online Investing: Brokers, Investors, Statistics, and Market Trends // eMarketer. 2002. June.

[15] Meyer Th. The worst is over for online brokerage // Deutsche Bank Research. E-Banking Snapshot. 2006. 17.

The main motives for participation in online trading include convenience, speed of getting information and closing transactions, lower fees. Research shows that the probability of users participating in online trading grows along with the number of other financial products sold online, including use of Internet banking.

According to a survey from 2007 among the clients of the leading British brokerage company for retail investors Barclays Stockbrokers [16] 62 % of them bought securities online, with 44 % of them regularly investing this way. In order to overcome one of the substantial obstacles before online investing — the consumers difficulty in making investment decisions, Barclays Stockbrokers developed the so called "Investment Selector" [17]. This is a web-based software module that helps investors choose those investments that best match the level of risk they are ready to take.

More recent data from the research company Aite Group illustrate Americans' investment activity towards the end of 2010. They show that 19 % of the value of all retail investments are managed with the help of online brokerage firms, with this share being 12 % higher than the pre-crisis levels of the years before 2007–2008.

Actual data on the users' perception of online trading and the number of online investors is presented in a study (BMO InvestorLine Study) [18] performed by one of Canada's leading bank groups, Bank of Montreal, published in May 2013, point that at the moment 20 % of Canadians invest online and this percentage is expected to reach 65 % over the next five years, reaching 80 % for the clients aged 18–34 in 2018.

The development of e-brokering is directly dependent on the development of the capital markets themselves, one of whose distinguishing characteristics is volatility and instability. The decline in the investment activity of the population has a negative impact on the number of consumers using e-brokering services. The above dependency is supported by the consequences of the capital markets crisis from the end of 2001 till the beginning of 2003, when the demand for online brokerage also fell.

[16] Barclays Stockbrokers is a subsidiary of Barclays Wealth and currently manages securities for £1 billion. In his order at the beginning of 2007 was made a survey of its customers by the company YouGov. Source: Barclays Stockbrokers launches new online tool to help investors make their own decisions [Electronic resource]. URL: http://www.24–7pressrelease.com/pdf/2007/04/13/press_release_26929.pdf (date of access: 18.02.2015).

[17] Barclays Stockbrokers [Electronic resource]. URL: https://www.stockbrokers.barclays.co.uk/AccountOpening/InvestmentSelector.aspx?category=registration&usecase=IST&host=Barclays&&QS= (date of access: 31.07.2017).

[18] Forexmagnates [Electronic resource]. URL: http://forexmagnates.com/signs-of-prosperity-for-online-investing-in-canada/(date of access: 23.01.2015).

A major segment of online trading is trade in foreign currencies, or the so called currency pairs. This fact corresponds with the principle that the currency market — FOREX (foreign exchange or FX) is the biggest financial market. The *daily* volume of world currency trade varies between 4–5 trillion dollars on average (in April 2013 this volume reached the maximum value of 5.3 trillion USD [19]). Retail trade at the FX market accounts for about 4 % of the total turnover, with the highest volumes in absolute value realized in the USA and Japan [20]. Electronic trade dominates the FX market — statistics show that over 50 % of individual investor's trade through an online channel.

Self-study questions

1. What does the concept of online trading mean?
2. How are the traditional brokers with physical branch network categorized?
3. What are the functions of online brokerage?
4. What are the main types of brokers offering online trading in securities and currencies?
5. How can the users be distinguished according to their behavior in stock trading and also their attitude towards online trading?
6. What are the main advantages that online brokerage provides for users?
7. Name key stages in the development of e-brokerage in the world and also name the leading countries with most users in Europe.
8. What are the correlation levels between the development of capital markets and e-brokerage?

1.2. Electronic banking

The financial sphere and banking, in particular, is one of the areas where the use of modern information technologies has been traditionally strong ever since their intensive development started. Owing to the use of bank information technologies the quantitative and qualitative expansion of the market for products and services is now possible, as well as increasing competition between banks, gaining a larger market share, not least by using various distribution channels. Traditional serving the client over the counter in the

[19] Rime D., Schrimpf A. The anatomy of the global FX market through the lens of the 2013 Triennial Survey // BIS Quarterly Review. 2013. December. P. 1.

[20] Ibid. P. 39.

branch network of banks ("bricks and mortar" branches) is complemented both by physically existing channels (Point-of-Sale / POS/terminals, Automated Teller Machines (ATMs), multifunctional devices / kiosks), and by new electronic channels, whose variety is comprised in the general term electronic banking or e-banking.

The need for applying new information technologies in banking results from the following reasons:

- the constant growth of the number of banking operations suggests the use of new instruments and methods for information processing;
- growing requirements regarding the quality, accuracy, reliability and security of collecting and processing information;
- increased competition between banks causes a fight for attracting clients, which in turn drives the constant improvement of the quality of bank services;
- growing requirements on the part of consumers for gaining remote access to bank products and services in a way that is convenient for them, without limitations relating to time or place, i. e. in a 24/7 mode.

Apart for serving clients over the counter, based on operations of the main banking system, over the last few years banks have been exceptionally active in offering services through systems and instruments for remote bank servicing known as remote or direct banking, which includes providing electronic bank services through various distribution channels.

1.2.1. The essence of electronic banking

Electronic banking is a general term for the process, whereby consumers use bank services electronically, without visiting bank offices. E-banking is defined as an automated delivery of traditional and new bank products and services directly to the clients through electronic and interactive communication channels [21]. It includes systems which allow the clients of financial institutions, individuals or companies access to various kinds of financial transactions or getting information about financial products and services over public or private networks, including the Internet. Electronic delivery channels are able to transmit and distribute information in a digital format. After information on banking transactions is distributed digitally, it can be rapidly and easily stored, analyzed and used by other systems.

Consumers have access to e-banking services by means of intelligent electronic devices, such as a personal computer (PC), Personal Digital Assistant

[21] Joshi V. E-finance: the future is here. 2nd ed. New Delhi : SAGE Publications India Pvt Ltd., 2010. P. 37.

(PDA), tablet, an automated teller machine (ATM), a multifunctional device (kiosk), mobile or fixed- phone with tone dialing and other.

From the point of view of the costs related to its offering, electronic banking is relatively inexpensive; therefore the barriers for its marketing are low. As a result, offering e-banking is not limited to large and well-established banks. In view of the huge competition, e-banking is turning into a staple service, which clients necessarily expect to receive from financial institutions.

Electronic distribution channels can be used for providing three types of service: information, transactional and for performing sales. This differentiation prevails in literature, including that of European Central Bank (ECB)[22]. According to it, information services, also called passive operations include checking the account balance and account turnover for various kinds of accounts, including deposits made for the purpose of trade in securities; printing out account statements; getting information on exchange rates, interest rates, fund indexes, etc. Transactional services include money transfers, paying bills and other. Sales include purchase of / or applying for the purchase of financial products, for example savings deposits, personal loans and mortgages, bank cards, securities and other, that is, more complex and complicated products and services.

Other authors (V. Joshi) classify e-banking services in two groups — Basic and additional (Premium) products[23]. The first group covers: check on account balance; money transfers; paying utilities bills. The second one includes all basic products plus opening a new account; cash management; confidential services; bills presentment; insurance.

Out of the two classifications it is the first one that is much more established in both the theory of banking and e-finances and in practice, hence it is this classification that we shall adhere to in the following presentation.

Initially the term electronic banking was mostly applied in the context of automation of transactional services, but since then it has been used for buying and selling financial products and instruments.

1.2.2. Types of electronic banking

Electronic distribution channels, through which electronic banking is implemented, comprise: fixed telephone; the Internet; mobile communication channel with use of mobile devices, incl. mobile phone, smart phone, tablets, PDA devices, etc; fax, interactive digital television (iTV). Depending on channel, the following five types of e-banking can be differ-

[22] EU Banking Structures // European Central Bank. 2002. P. 42.

[23] Joshi V. E-finance: the future is here. 2nd ed., New Delhi : SAGE Publications India Pvt Ltd., 2010. P. 46–47.

entiated: telephone banking; PC banking; Internet banking; mobile banking; TV banking.

A certain chronology can be observed in the development of the types of electronic banking — initially it was telephone banking that won recognition, later on PC, Internet and in the end — the new forms: TV and mobile banking.

Telephone banking

As the oldest form of remote banking, telephone banking has been offered by western banks since the late 1970s. It is the first major electronic distribution channel. It suggests telephone contact between the client and the bank and access is provided for:

- information and inquiry services — the client gets information on balance and account movement, interest rates, exchange rates, etc. either by voice messages or automatically by fax or e-mail;
- transactional services — it is possible to perform money transfers, transfers of funds, pay utility bills, currency exchange and other.

Telephone banking is implemented in two variants:

- through communication with a bank official, most often via Call center. Depending on the coverage of service and equipment, the client can get in contact with an official or a bank assistant, respectively. Two types of calls are distinguished — Inbound Calls (the client phones the Call center) and Outbound Calls (Call center phones the client, for example, at a time that has been agreed on in advance) [24];
- through Interactive Voice Response (IVR). In this case the client's access to the bank information system is realized without an intermediary, but with the telephone keypad instead, and a voice menu, whereby there is no requirement concerning the type of telephone line — digital or analog, fixed or mobile. When fixed analog connection is used, the set must allow for tone dialing.

Some systems for telephone banking allow the clients to switch from one variant to the other, depending on the service that is requested. Protection from unauthorized access is performed by means of a personal identification code and a password. Consumers' access to telephone banking is usually graded depending on whether they need general bank information (i. e. access to it is free — information on exchange rates and interest rates on current accounts and a variety of deposits) or they wish personalized informa-

[24] Locarek-Junge. Banken im Wandel — Direktbanken und Direct Banking. Berlin : Berlin Verl. A. Spitz, 2000. P. 90–91.

tion (i. e. access is limited by the requirement for entering client number and a password) such as information about balance and accounts movement. The client may obtain the resulting information by choice — over the telephone or by e-mail/fax. Telephone banking is available at nearly all large banks in the EU, including those in Bulgaria.

PC banking

PC banking, also known as online computer banking or "home banking", is a form of electronic banking prior to Internet banking. Applications for PC banking have a server side and a client side. Their interaction is based on a telephone line and a modem or, less often, through a hired line. It is necessary for the bank to install and support the client's side, that is, special banking software on the client's computer. Through this computer the client has access to nearly all bank services, both inquiry and transactional ones. It allows the clients of the bank, predominantly corporate clients, to manage their company finances quickly and conveniently from their office, day and night.

Some PC banking applications support facilities for export (import) of data from clients' accounting programs. This entails more costs for the clients compared to the Internet, as banks tyFigally charge fees for installing and support of the specialized banking software. The client's side of the system for PC banking can work in an online or offline mode. In the latter, changes in the client's accounts are recorded in the bank's database not in real time, but during session connection with the bank.

The latest variants of PC banking systems, such as the system MultiCash of the German firm Omikron GmbH, are based on thin-client model, that is optimized software components (plug-in, Java applets) communicate with the bank system through a standard browser at a guaranteed level of security [25]. A plug-in is integrated in the browser, which is activated automatically and exercises control in the defined field on the page where the client enters information. All the dialogs between the bank and the client are managed by a separate Secure-Bank-Server in the bank's system. From the point of view of the client, the system Browser, Plug-In and Secure-Bank-Server represent a whole.

Security of PC banking is guaranteed by the use of electronic digital certificates and cryptographic methods for encryption of information.

[25] Ursheva J. E-banking is becoming part of everyday life of the Bulgarians // Computerworld. 2004. Sofia. No. 3.

Internet banking

Internet banking refers to the provision of bank products and services through electronic channels for delivery on the basis of computer networks and Internet technologies, including landlines, cell and wireless networks, and web based applications and mobile devices [26]. The basic requirement is for clients to have a web browser, with which, after being registered for the service, they log on the bank's site and gain access to bank products and services.

The software implementation of the system for electronic banking has two sides — bank side and client side. Bank side carries out users' registration, authorization, organizing access to clients' accounts and processing queries, transmission of information to the client over the Internet, and ensuring security. Client side realizes logging in the Internet, transmission of information about authorization (registration number, client password), forming a query, interpretation of data received from the bank's system.

Different banks have different technical, technological and financial capacity for real exploitation of potential Internet solutions. Different types of Internet banking can be differentiated and these are presented in the next chapter "Internet banking — a key element of financial Internet-based services".

Basic business models for offering Internet banking

There are two basic business models through which Internet banking is provided. In the first one traditional bank combine offering bank products and services in brick and mortar branch network and offices and their offering on the Internet.

In this way they realize the so called multichannel distribution strategy, hence their designation as multichannel banks (fig. 1.1).

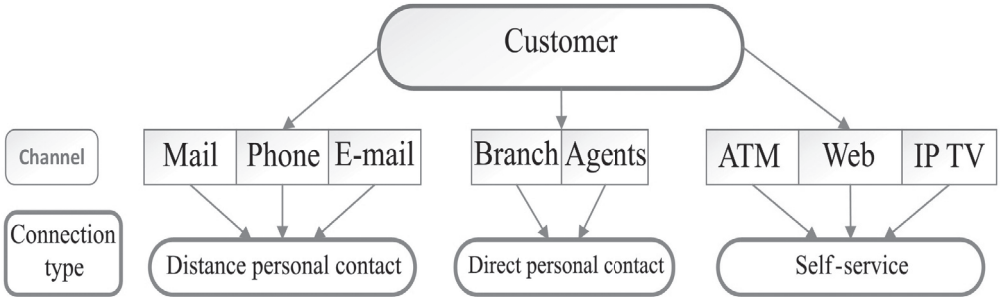

Fig. 1.1. Customer service through different channels with different connection type

[26] Internet Banking and Technology Risk Management Guidelines // Monetary Authority of Singapore. 2008. June. P. 2.

The other business model is connected to Internet banks or virtual banks. Possibilities within this business model vary from:

1. Pure Internet banks / Internet-only banks — independent banks, individually licensed by bank regulators. TyFigally they don't have branch network, but offer their services only, or mainly, through electronic delivery channels. Withdrawal and depositing of funds in these banks is carried out either through their own or hired from other banks ATMs or kiosks [27]). In the years of the dot.com boom (1998–2001) this model considerably expanded its market presence, but later a large number of these banks went out of business. Examples of such banks are: American First Internet Bank of Indiana, Bank of Internet USA and NetBank; Japanese Japan Net Bank and SBI Sumishin Net Bank; Egg Banking (a former British Internet bank, at present owned by Yorkshire Building Society); Skandiabanken (Sweden) and other.

2. Traditional bank creating its own Internet brand and a dedicated website, leading to the impression that there is a separate entity behind the brand [28]. Examples for that are: the British "bank" First Direct, a division of HSBC Group, and not a separate legal entity; Smile, a division of the UK-based Co-operative Bank; the Polish mBank, a division of BRE Bank and other.

3. The Internet bank being declared a subsidiary or a branch, including a foreign one, of the conventional bank. An example for such a bank is Openbank, a division of Banco Santander in Spain; RaboDirect, part of Rabobank and other.

Over the last few years most countries adopt the first business model of combined offering traditional and electronic delivery channels which is known in literature as "brick and click banks" [29]. Multichannel strategy remains the preferred distribution model for most European banks.

Use of Internet banking is expanding its scope with the number of users constantly growing. Data published by the official statistical institution of the European Union — Eurostat for the period 2003–2014 show that by the end of 2014 the percentage of Internet banking used in EU 27 averages 44 % (table 1.1) and over a period of 10 years, use has grown by 175 % [30].

[27] Kiosk is typically multifunctional and allow customers to serve themselves and perform more complex and long transactions, compared to the services available at the ATM.

[28] EU Banking Structures//European Central Bank. 2007. Oct. P. 44.

[29] Schaechter A. Issues in Electronic Banking: An Overview // IMF Policy Discussion Paper. 2002. P. 4.

[30] Data refer to persons aged between 16 and 74 who used the Internet banking at least once in the last 3 months.

Table 1.1

Individuals using the Internet for Internet banking (percent of individuals aged 16 to 74)

Country\Year	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Iceland	48	54	61	67	72	68	72	77	80	86	87	91
Norway	49	55	62	67	71	75	77	83	85	86	87	89
Finland	43	50	56	63	66	72	72	76	79	82	84	86
Netherlands	:	:	50	59	65	69	73	77	79	80	82	84
Denmark	38	45	49	57	57	61	66	71	75	79	82	83
Sweden	38	40	51	57	57	65	71	75	78	79	82	82
Estonia	:	35	45	48	53	55	62	65	68	68	72	77
Luxembourg	23	35	37	41	46	48	54	56	59	63	63	67
Belgium	:	:	23	28	35	39	46	51	54	56	58	61
France	:	:	:	18	34	40	43	50	51	54	58	58
United Kingdom	22	22	27	28	32	38	45	45	:	52	54	57
Latvia	:	12	16	22	28	39	42	47	53	47	55	57
Germany	21	26	:	32	35	38	41	43	45	45	46	54
Austria	13	18	22	27	30	34	35	38	44	45	47	49
Lithuania	3	7	10	15	21	27	32	37	41	44	49	48
Ireland	8	10	13	21	25	28	30	34	33	43	46	48
Euro area	:	:	20	22	28	31	34	37	39	41	43	45
Malta	:	:	16	16	22	25	32	38	42	41	43	45
EU (27 countries)	:	16	19	21	25	29	33	36	37	40	42	44
...	...	...	...	...	...	...	...	...	...	...	...	...
Greece	1	1	1	2	4	5	5	6	9	9	11	13
Bulgaria	:	1	:	1	2	2	2	2	3	4	5	5
Romania	:	0	:	1	2	2	2	3	4	3	4	4

In individual countries this share varies widely — from 5 % in Bulgaria and 4 % in Romania to 89 % in Norway, 86 % in Finland (from 43 % in 2003), 84 % in the Netherlands, 83 % in Denmark, 82 % in Sweden (from 38 % for both countries in 2003), 77 % in Estonia, etc.

Based on these figures, we can make the conclusion that the proportion of population who use web banking is rapidly growing. This trend is the strongest in Scandinavian countries and the Netherlands. There is a marked correlation between households' access to and use of the global network and using Internet banking, as according to Eurostat data, it is exactly in these countries that Internet penetration has the largest share (according to data for 2014 households' access to the Internet is as follows: in the Netherlands — 95 %, Finland — 89 %, Norway — 88 %, Sweden — 87 %[31]).

There is a wide variety of reasons for the positive development of the use of Internet banking. The basic ones are, on the one hand, associated with the maximum convenience for the consumers and the affordable service, and on the other — with the preferential interest rates and service fees.

The first advantage means that via the Internet banks offer a service which consumers use in their home or office 24 hours a day and, in addition, without any special software. The second advantage is achieved owing to the fact that web services operational maintenance costs are several times lower, as they do not require numerous staff members, costly offices and equipment. All that allows banks, via the Internet distribution channel, to realize services with competitive advantages that are out of reach for classic banking. Quite logically, the Internet has become the bank channel characterized by the highest degree of customer satisfaction (57 % "very satisfied" against 35 % for bank branches and 29 % for telephone banking) [32], according to results from the survey of European Financial Management & Marketing Association (EFMA) and partners, published in 2004. The high degree of satisfaction is associated in particular with ease of access (69 % "very satisfied" against only 9 % for the bank branch).

As regards the offering of Internet banking it can be summarized that nearly all banks offer Internet banking, at least as a channel for information and transactional services. Worldwide, providing online banking services to consumers is rapidly increasing.

Banks' costs per standard transaction via the Internet are considerably lower than those of brick branches, so banks have a long-term stimulus to develop this channel in future. This fact is substantial grounds for the banks to conduct an active marketing policy of directing clients to using the online channel. Banks provide various incentives for the users, such as the same products

[31] Eurostat [Electronic resource]. URL: http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&language=en&pcode=tin00073&plugin=1 (date of access: 15.03.2015).

[32] The survey was conducted among 1016 European users of Internet banking services and results were published in a study entitled "Internet banking, a new wave?".

and services as those offered in branches, but at lower fees and commissions, or at better interest rates, including some online bonus; offering certain products only via Internet banking and not in their branch network and other.

Compared to branches, for the time being the Internet is of limited importance as a sales channel. Over the last few years a growing number of banks offer their clients the opportunity to buy products like: saving accounts, personal loans, bank cards, mortgages and other, but their sales are still minor, particularly in the new EU member states. Scandinavian countries and the Netherlands are an exception, as there the Internet has solid positions as a substantial sales channel. Banks make considerable efforts to firmly establish Internet banking as a sales channel and to this end they undertake various activities like: developing special Internet offers; services with fewer fees; improving the systems for online banking, incl. paying special attention to their security and safety; better integration with the other distribution channels.

Types of Internet banking systems

Three types of systems for Internet banking can be differentiated depending on the interaction and communication with consumers [33]:

- In the information type only one-way communication is available and the bank uses the Internet for the sole purpose of advertising and presenting its products and services, that is, the website performs the role of a marketing tool. Such a website may allow the bank to collect visitor data in order to better specify its marketing and placement efforts. TyFigally the bank supports marketing information about its products and services on a dedicated server. This level of Internet banking can be provided by the bank itself or by an outside contractor through outsourcing. With respect to the risk involved, this can be defined as relatively low, as information systems usually are not based on the connection between the server and the bank's internal network.
- Communication type systems for Internet banking allow two-way communication between the client and the bank's systems. Interaction can include electronic mail, inquiries about an account, downloading documents from the site and sending files and other. Internet banking servers can be communication-linked to the bank's internal networks, therefore the respective risk is higher than with the previous type of banking. For this reason, suitable controls are necessary for prevent-

[33] Comptroller of the Currency Administrator of National Banks // Internet Banking. Comptroller's Handbook. 1999. October. P. 4.

ing, monitoring and managing signals concerning attempts at unauthorized access to internal bank networks and computer systems. Corresponding controls and malware applications are necessary.

- Transactional type systems are the most complex ones; with them after the client has been identified, it is possible to connect him/her to the operational systems of the bank and perform financial transaction in real time mode. There is usually communication between the server for Internet banking and the bank's internal system, or in case of outsourcing — with the network of the outside contractor and consequently, the corresponding risk with this type of banking is the highest and the most powerful controls should be envisaged.

Because of the fact that the technology for delivery of banking services via transactional type Internet banking is inexpensive and reliable, at present most banking systems, including those in Bulgaria, belong to these type of systems.

There are other classifications of the systems for Internet banking suggested by certain authors and institutions which are not substantially different from the one discussed above. The central bank of India (Reserve Bank of India (RBI)) for example, divides the systems into 3 types [34]:

- Information providing system — this type of system offers on the bank's website only general-purpose information, for example interest rates, branch location, bank products and their characteristics, loan and deposit calculators and other. There are possibilities for downloading various application forms (for example, for bank cards, loans, etc.), and communication is usually carried out by electronic mail. There is no interaction between the client and the internal systems of the bank. Client is not identified and it is impossible for an unauthorized person to gain access, via the Internet, to the bank's internal systems.
- Information exchanging system — this system provides client-specific information — balances and account statements, transactional data, etc. Information is in a "read only" mode and is retrieved by applied banking systems in batch mode or offline. Client's identification and authentication is carried out by means of a user name and password. Applied systems cannot be directly accessed via the Internet.
- Transactional system — this system allows two-way interaction with users, i. e. they can initiate online transactions, and perform routine

[34] Vinayagamoorthy A., Senthilkumar K. Role of reach of Internet Banking in India. P. 5.

operations. The server of the Internet banking systems is linked via secure infrastructure with the bank's applied systems.

Technology and organization of the Internet banking systems

It is possible for Internet banking systems to differ considerably in their scope depending on a number of factors. Financial institutions choose the scope of an Internet banking system, including their relationships with other firms regarding outsourcing of activities and services, by taking into consideration four factors [35]:

1. Strategic objectives of Internet banking.
2. Scope, scale and complexity of equipment, systems and activities.
3. Technological expertise.
4. Security and internal control requirements.

Organization and support of Internet banking systems

Banks have two basic options for supporting their Internet banking services. The first option is to support services internally, with their own capacity and efforts. The other option is to outsource certain aspects of their Internet banking systems to third parties — outside contractors. Banks can use the services of the following organizations, which provide or host (i. e. allow applications to reside on their servers) various activities [36]:

1. Another financial institution.
2. Internet service provider (ISP).
3. Internet banking software vendor or processor.
4. Core banking system vendor or processor.
5. Security system provider.
6. Utility bill payment provider.
7. Credit bureau [37].
8. Credit scoring company.

Components and processes in Internet banking systems

Internet banking systems include a number of *common components and processes*. The tyFigal list may include:

- Web design and hosting.
- Firewalls configuration and management.
- Intrusion detection system (IDS) (network and host-based), tracking network or systems activities for malicious activities or intrusion.

[35] FFIEC: IT Examination Handbook InfoBase [Electronic resource]. URL: http://ithandbook.ffiec.gov/it-booklets/e-banking/introduction/e-banking-components.aspx (date of access: 20.01.2015).

[36] Ibid.

[37] Credit bureaus collect and provide information on users' loans and debts and exchange data between banking and non-banking institutions.

- Network administration.
- Security management.
- Internet banking server.
- Certain relatively independent applications, for example bill paying; loans; e-brokering and other.
- Internal network servers.
- Core processing system.
- Automated decision support systems and other.

These components work together to deliver e-banking services.

Advantages of Internet banking

The various direct distribution channels for bank products and services, and particularly the Internet, provide a number of advantages for both its users and the bank institutions. For this reason advantages should be considered from the view point of the two parties that participate in the process:

1. *From the banks view point* the advantages provided by Internet banking can be summarized in the following directions:

- Access to a wider client audience.
- Cost-saving on expansion of the branch network and equipment of costly offices.
- Cost-cutting on marketing, advertising and placement of bank products.
- Reduced time for new products and services to reach the bank's clients.
- Possibility for the bank to free customer service employees from performing routine operations clients can now perform on their own. These specialists could be directed to providing clients with high quality and comprehensive services, which are increasingly required by more sophisticated bank products like granting various loans — personal or mortgage; issuing credit cards, and other.

2. *From the point of view of the consumers* the advantages provided by Internet banking can be systematized in the following directions:

- There is a possibility for a much wider choice of bank (access to a wider range of banks, including foreign ones) — nearly all banks are virtually presented through their own website.
- There are no geographical limitations — Internet banking allows extended access to clients by expanding geographical reach and lowering costs of distribution channels. In fact certain banks do business exclu-

sively via the Internet — they do not have the traditional bank offices and reach their clients only online. Other financial institutions use the Internet as an alternative delivery channel in order to reach existing clients and attract new ones.

- There are no time limitations for the consumers' access to bank products and services — with Internet banking they are able to initiate bank transactions 7 days a week and 24 hours a day (7/24).
- Timesaving and convenient access to banking services.
- Access to Internet banking is usually free for individual users and banks often offer products and services at more advantageous prices — with lower fees and commission than those over the counter in the bank branch. Corporate clients are tyFigally charged inexpensive fees for Internet banking.
- Internet banking places banks in a highly competitive environment, which brings about lowering the prices of the bank products and services provided, while their quality and variety are improving.

One of the basic advantages of the remote distribution of bank products and services, predominantly via the Internet, consists in the lower costs involved in their realization. A number of valuations of these costs have been made by various authors, companies and analysts, who have published them in 1their research. Table 1.2 presents some of them.

A standard bank transaction could be, for example, interbank money transfer. Data in the table show that according to the various research and sources banks costs for such a transaction via the Internet are from 23 to 70 and even 100 times as low as those involved in conducting the transaction in a traditional bank branch. According to a survey of Bainbridge at al., cited in the same source (Heffernan), transactional costs via the Internet, including those for the IT systems necessary, amount to 10 % of the costs incurred by the traditional bank branch.

According to valuations made by Fiserv company, the biggest information service provider for the financial sphere worldwide, it is exceptionally effective for banks to reorientate their customers to conducting transactions through the online channel — the following calculations prove that: a financial institution performing 1000 operations a day in a traditional branch spends $1 m a year on processing these transactions. By encouraging clients to conduct only 30 % of their transactions online, the bank will cut nearly $290 000 in processing costs every year.

Table 1.2

Costs for frequent banking transaction according to various sources

Distribution channel	Sources, $		
	Booz, Allen and Hamilton[38]	Wood[38]	Fiserv[39]
Bank Teller	1.07	1.00	4.00
Phone (IVR[40])	0.54	–	1.25
Contact center	–	–	3.80
ATM	0.27	–	0.90
Internet	0.015	$0.01	0.17

Internet banking also has certain disadvantages, such as, for example, security issues, growing costs for ensuring/safeguarding a higher degree of protection for Internet banking systems, limited possibilities for Cross-Selling (Cross-Selling is a notion referring to the complex (package) offering, on the part of banks, bank products for fuller satisfaction of customer needs). It should be pointed out that with Internet banking, as well as the other electronic channels, there is no personal contact with a bank official, and such a contact is indispensable for complicated bank services.

Relying on the new technological solutions, banks make serious IT investments in order to enhance Internet banking applications and expand their functions, including by adding facilities to compensate the lack of physical contact between the client and a bank official. Some banking solutions already provide interactive advice, chat function on the bank website or conversations with a personal consultant by means of a webcam (video channel).

Mobile banking

Mobile banking (m-banking) is defined as a channel where clients interact with their bank via a mobile device (mobile phone, smart phone, PDA[41]), tablets and other smart portable devices which usually come with Internet access. It is defined as a subcategory or an improvement on Internet banking.

[38] Heffernan Sh. Modern Banking. Chichester: John Wiley & Sons Ltd, 2005. P. 92.

[39] Fiserv, Inc. [Electronic resource]. URL: http://premier.fiserv.com/redesignyouronline/roi.html (date of access: 20.02.2014).

[40] IVR — Interactive Voice Response System.

[41] Personal Digital Assistant — portable computer, usually without keyboard, which is used for various purposes. PDA is also known as pocket computer or palmtop computer.

Mobile banking solutions are based on 3 approaches which comprise:

1) access to the bank website via mobile device web browser — essentially there is no difference in online banking with a browser via a mobile device (tablet, smart phone, etc.) or a desktop PC;

2) using *dedicated banking software*, that has to be installed on the mobile device — the so called Mobile Banking Applications (Mobile Banking Apps) or Smart client solutions, which are essentially software solutions, enabling bank clients to prepare their transactions offline, and then only the data transfer is online. Clients find it more convenient to do their banking via such a suitable application installed on the device. Many banks already provide mobile banking applications to their clients for free;

3) *text* messages (SMS-banking).

At the moment m-banking is mainly used for informational services and sometimes for transactional services, but rarely as a sales channel. Message based services are also considered as m-banking. In this case a client may get SMS or MMS with bank information, for example, about the balance on his/her account, the last few transactions, overdraft on the account, etc.

Mobile banking was introduced by a number of banks in the US and Europe *in the late 1990s*. Initially it was based on Wireless Application Protocol (WAP) and its use required that clients' cell phones should have WAP-browser. This stage was characterized by a number of technical imperfections with respect to mobile networks and devices: data transfer limitations because of insufficient speed of 2 and 2.5 generation networks (GSM, GPRS, EDGE [42]) and the costly communication, small screen mobile phones interface not convenient enough, lack of QWERTY keyboard, difficulty in visualizing and entering long text, etc. They prevent the quick and efficient remote service of clients. Many banks are abandoning this service, as m-banking failed to earn a recognition as a successful distribution channel.

After a standstill of about 5 years, banks are again turning their attention to mobile banking. The reasons for that can be grouped in several aspects. Mobile communications develop rapidly; 3 and 3.5 generation (3G and 3.5G) networks like UMTS, HSDPA, HSUPA [43] and other are entering mobile communications and they have much higher speed and expanded capacity of data transfer; they allow access to broadband Internet; they reduce mobile services price; mobile devices (incl. smartphones, PDA) are getting consid-

[42] GPRS — General Packet Radio Service and EDGE — Enhanced Data Rates for GSM Evolution.

[43] UMTS — Universal Mobile Telecommunications System, HSDPA — High Speed Downlink Packet Access, HSUPA — High-Speed Uplink Packet Access.

erably more sophisticated and intelligent and support protocols like HTML, XTML, SOAP [44], XML.

Regarding the level of standardization, there has been some progress recently, but so far, it is still unsatisfactory. There are many aspects to problems — *on the one hand,* the various mobile devices possess a wide range of facilities depending on their class and technical characteristics; some support Java2 Micro Edition (J2ME), others support WAP browsers or only SMS. *On the other hand,* there are no common technological standards for mobile banking. Different protocols are used (HTML, SOAP, XML), and consequently banking applications have to support a large number of protocols or use a set of widely recognized protocols for data exchange.

Over the last few years a number of large US banks, incl. Bank of America, Citibank, Wachovia и Wells Fargo, have been implementing mobile banking solutions *of a new generation* and report a considerable rise in clients. An example of the boom in the use of mobile financial services and m-banking are countries like South Africa, Kenya and other African countries; the Philippines, where it is applied by banks in order to reach poor people who had never used banking services before (the so called unbanked population), as well as in countries like Japan, South Korea, etc.

A number of analyst companies (TowerGroup, Frost&Sullivan, Aite Group) predict huge growth potential for mobile banking.

According to the findings of one of the latest studies, a report published by the US Federal Reserve on the use of mobile banking as of the beginning of 2012, 87 % of US population own a mobile phone, 44 % of mobile phones are smart phones (supporting Internet), and 21 % of mobile phone owners have used mobile banking in the last 12 months. Another 11 % declare it is likely they can start using it over the next 12 months. In addition, 17 % of those claiming they are unlikely to use mobile banking services over the next 12 months believe that they will "definitely" warm up to mobile banking at some point in time. These results point to the huge potential of mobile banking in the future.

As an obstacle for the adoption of mobile banking services by consumers one points out the dangers involved in security; potential scams; fears of losing a phone containing personal financial data; the prices of mobile financial service and other. Offering mobile financial services is also complicated by the requirement that banks should establish certain business relationships with the operators of mobile networks.

[44] XTML — eXtensible Telephony Markup Language. SOAP — Simple Object Access Protocol.

We believe that despite the hurdles, prospects are bright for m-banking, because of the growing penetration of mobile phones and 3generation services among users, which facilitates the use of bank services through this distribution channel. Forecast is also positive for Bulgaria, where by the end of 2011 the number of smartphone users is over 1 million or more than 12 % of all consumers [45]. Besides, at the beginning of 2011 their number was around 700 thousands, which constitutes a major growth of about 42 %. Respectively, it is expected that the number of mobile banking users will grow in Bulgaria.

TV banking

Television banking is based on the use of Interactive Digital TV (iDTV). A necessary requirement for the user is to have access to such television, with the only additional device plugged in the TV set is an external MPEG-4 [46] decoder (set-top box — STB), in case the TV receiver does not have built-in digital tuner and the above decoder. The client uses the services by means of the TV remote control and menus, navigation achieved with the help of arrows, numbers and color teletext buttons. In order to provide TV banking to their consumers, banks need to cooperate with cable or satellite providers of interactive television. Thus clients get access to both informational and transactional services: information on account balance, transfer of funds between accounts, initiating payments to predefined third parties and other.

Among the favorable conditions for the development of TV banking is the high rate of TV set ownership (nearly 100 %), as well as the growing penetration of digital televisions.

Some bank analysts believe that in the developed geographical regions of the world TV banking is not competitive against Internet and PC banking [47]. It is also considered that its target markets are predominantly Asian countries like India, China and other, not least because their population is more disposed to watching video.

As a rule, banks view elderly clients as potential users of TV banking, since these people do not have a computer and Internet access or feel apprehensive regarding the use of the global network for banking operations.

[45] According to data from research analyzes agency „Mobile Review“ Source: Vesti [Electronic resource]. URL: http://www.vesti.bg/index.phtml?tid=40&oid=4485451 (date of access: 02.03.2015).

[46] Moving Picture Experts Group (MPEG).

[47] Your TV as your bank [Electronic resource]. URL: http://www.thehindubusinessline.com/todays-paper/your-tv-as-your-bank/article1679948.ece (date of access: 13.03.2015).

As with mobile banking, there are two periods to be outlined in the development of television banking:

1. The first one, in the late 1990s, when TV banking emerged and rather slowly showed its potential, causing many banks to start, and later stop offering TV banking. In Europe the pioneers of offering TV banking are a number of banks in the UK (HSBC, Abbey National, Lloyds TSB Group, Egg, Woolwich and other) and France (Credit Agricole and other), some of which later stop the service. According to research done by Forrester Research and published in 2001, leading financial institutions in the UK initiated offering IdTV but weak consumer interest and technology limitations prevented the short-term return on banking investments in the development of this distribution channel. At the time around 7 % of the 11 million interactive users in the United Kingdom used TV banking [48].

2. The second period, after 2006–2008, associated with the application of newer technologies like Internet Protocol Television (IPTV), i. e. digital television delivered through Internet protocol.

Later some banks start digital interactive TV banking or TV banking based on smart televisions. At present they are offering it as a component of their various distribution electronic channels. Examples of banks offering TV banking include: Brazilian bank Banco do Brasil offers its clients TV banking as a result of a signed agreement for partnership with LG Electronics for their product line of Smart TV [49]. Scotiabank of Peru, together with Samsung, have launched an application enabling users to conduct banking operations via the Smart televisions of the Korean manufacturer. It is considered that the possibilities for using TV banking are aimed mainly at countries where there is a marked preference for TV and video consumption like India, China and countries in Latin America.

Overall, this channel is not considered by ECB to be an insignificant distribution channel for EU banks [50]. Expectations are for a huge potential for future development with the growing penetration of IPTV.

As a summary of the reviewed remote channels for remote delivery of bank products and services, it can be pointed out that ITs have drastically changed, and will continue to substantially impact bank strategies and business models. Banks will develop and enhance their multi-channel management in order to offer their consumers the fastest and most convenient for them access to bank services at any time and any place (anytime, anywhere' approach).

[48] Centeno Cl. Adoption of Internet Services in the Enlarged European Union. P. 24.

[49] Banco do Brasil // Annual Report. 2011. P. 95.

[50] EU Banking Structures // European Central Bank. 2007. Oct. P. 42.

Self-study questions

1. What is electronic banking?
2. Telephone banking can be offered in different variants, please name them.
3. What are the elements of the apps for PC banking and what are the requirements for user access to PC banking?
4. Name the differences, and then the similarities between the use of PC and Internet banking?
5. Which are the parts included in a software implementation of Internet banking system and what are their functions?
6. What are the key business models for offering Internet banking?
7. Name the different options for mobile banking.
8. Do you think there is interconnectedness between the development of information and communication technologies and mobile banking and how much so?
9. What are the requirements for enabling the use of TV banking?
10. What are the stages in TV banking offering?

1.3. Security and protection of internet banking

Banking via electronic distribution channels increases the banks' dependence on IT and brings security issues to the foreground. Hazards occur mostly in online banking based on the use of the global network the Internet.

Internet banking has numerous advantages for both consumers and banks, but at the same time it is also associated with inadequate protection in some cases of web based systems, possibility for unauthorized access to client accounts and funds and online fraud.

To protect the transfer of information between client computer and bank servers and for access control, banks use predominantly standard digital certificates, issued by the bank itself or by an official certifying organization — an entity that issues digital certificates or so called certificate authority or certification authority (CA). With the use of SSL protocol and the associated with it 128 bits encryption, respectively TLS [51] protocol, a reliable protection is achieved for the transfer of data between the client computer and bank servers.

[51] SSL protocol — Secure Sockets Layer protocol; TLS protocol — Transport Layer Security protocol

Banks' biggest difficulties are associated with the secure confirmation of a user's identity, i. e. the issue of reliable authentication comes to the fore — how the bank can reliably and securely verify the genuine identity of the client. Entering just the user name, a static password and a choice of client certificate imported in the computer browser turns out to be a technology that is insufficient for a secure authentication of bank clients.

1.3.1. Potential threats for Internet banking users

Internet banking is associated with a number of potential threats for its users. These dangers result from technologies like phishing, pharming, the effects of various viruses, programs of the type "keylogger", trojans and other kinds of malware. They are used to commit a theft of confidential financial information — user names, passwords, codes, credit card details, etc. Unknowingly to users fraudulent financial operations are performed resulting in theft of money from client accounts, as well as a negative effect on clients' attitudes and a likely refusal to use electronic channels because of their inadequate security.

Phishing

Phishing is designed to steal confidential (sensitive) data. Via bogus e-mails and bogus internet sites, gullible users are being lured to enter and reveal personal information as User ID and passwords, bank account numbers, credit card numbers, PIN codes and other.

TyFigally, bogus e-mails imitate those sent by the banks themselves and, via a link, cause forwarding to counterfeit sites, identical to those of the banks and with a similar URL address.

Misleading domain names — URL confusion

One of the most common methods of confusion that scammers use is by intentional registration and using misleading domain names.

For instance, for the financial institution MyBank with a registered domain mybank.com and the client-connected transaction site http://privatebanking.mybank.com, it is possible for hackers to create a server by using some of the following names, for the purpose of facilitation confusion with the real host: http://privatebanking.mybank.com.de; http://mybank.privatebanking.com; http://privatebanking.mybonk.com; http://privatebanking.myb6nk.com.

The counterfeit site, for instance, that of the Bulgarian First Investment Bank has the following address www.finv-b.com, instead of the real one www.

fibank.bg. Confusion may arise through organizations for registration of domains, internationalization of domain activity and registration of domain names in foreign languages. For example, a Cyrillic "o" looks identical to the standard ASCII "o", but can be used for different purposes in domain registration (as, for example, a company that several years ago registrated microsoft.com in Russia).

Other possibilities suggested by the fraudulent technology of Phishing are connected with the following: an e-mail may insistently demand that a phone call is made to a telephone number provided and the number is a bogus one. It is possible to attach to the e-mail a form which has to be filled.

With the help of software it is possible to modify an e-mail header — sender, title, etc. Thus in the sender field the scammer enters an e-mail address that commands users' trust. Distinctive features for recognizing a bogus e-mail are: a much too general salutation (the attacker cannot possibly know the victim's name; he sends a lot of such attacks and waits for someone to "swallow the bait"); often the e-mail contains spelling or grammatical mistakes, figures are replaced by letters, letter index is inadequate or changeable (so that the spam filter is bypassed) and other.

Vishing

Vishing is defined as voice or VoIP phishing and is a fraudulent technology that acts by phishing but is not always realized via the Internet; instead it is most often carried out by using IP telephony (VoIP). A vishing attack may occur via voice message, VoIP, fixed or mobile phone.

Scammers use this technology to mislead users into revealing personal financial information over the telephone. While some users have learned to be susFigious to phishing scams, demanding disclosing sensitive financial information directly via the Internet, they are still easily persuaded to reveal such information, when called directly or via an e-mail, instructing them to call a certain phone number.

TyFigally, contact with the user is made by either the telephone or electronic mail. The potential victim gets a message, often by voice synthesis, which informs the user that in his/her credit card account or the Internet banking account a susFigious transaction has been conducted. The user is required to call a particular number and provide information in order to "verify his/her identity" or to "make sure the scam will not take place". If the attack is performed over the telephone, scammers make sure that the call appears to come from a legitimate source like the bank.

Pharming

When users enter a valid URL address in the address bar of the browser, instead of valid sites, they are directed to criminal websites. Readdressing to scam sites is achieved by infecting the local Domain Name Server (DNS). This includes an alteration to the specific record for the domain, which results in the user being sent to a site that is different from the desired (expected) one.

DNS server converts the website addresses the user writes in the address bar of the web browser into в IP addresses. For example, when the user writes the address of the site of Societe Generale Expressbank — www.sgeb.bg, the computer refers to the DNS server of its internet provider in order to learn the site's IP address and open it. If this address is replaced with another, on writing down www.sgeb.bg the request will be redirected to a server, containing an exact copy of the site. As the user wrote the address him/herself, he/she is not aware of the scam.

Another way is for cybercriminals to change the hosts file in the victim's computer. This file also contains information about IP addresses corresponding to website hosting names.

Trojan horses (Trojans)

Trojan horses are malicious programs masked as useful software, i. e. as legitimate software of the type: utilities, files attached to e-mails, games, etc.

In most cases users are duped into executing the malicious file in their computer systems themselves. Once open, Trojan horses act in a way very different from what is expected. They cause various problems to the infected system — from consumer annoyance (because of unwanted pop ups, changing the desktop wallpaper, sending e-mails to everybody in the user's address books and other) to inflicting serious damage (erasing files, theft of confidential data and propagating other malware).

A frequently used function of Trojan horses is the ability to create backdoors, through which access to the system is allowed to evil-minded users.

Active Trojans are an enhanced type of Trojan horses. They use unprotected ports to open communication lines with the user's computer and eventually provide to hackers control over the client machine. They are also called Remote Access Trojans.

Unlike viruses, Trojans do not propagate by infecting other files or replicating themselves in the network. Trojans are propagated by the users themselves, through users' actions: opening an attached file in an electronic letter, downloading and executing an Internet file and other.

A number of examples can be listed of Trojans whose basic function is to collect user banking data — among them being Zeus, the most popular banking Trojan (first identified in July 2007; in 2010 FBI announced they found out a large international cyberspace criminal network, whose members used Zeus in order to break into US computers and steal about $70 million); the Symantec-detected Trojan Neloweg [52]; Clampi (copying user names and passwords from banking sites and other financial websites and sending them to cyber scammers) and other.

Experts from anti-virus software company Kaspersky Lab view Brazil as the major source of the so called banking Trojans. The prerequisites include wide use of Internet banking and the associated criminal activity, the country's lack of effective legislation to fight cybercrime and other. The biggest Brazilian banks have millions of online banking clients — Banco do Brasil serves 7.9 million online clients, Bradesco — 6.9 million, Itaú — 4.2 million and Caixa — 3.69 million and consequently, the predominant amount of malware worldwide (over 40 %) steal from the bank accounts of Brazilian banks clients [53].

An important peculiarity of the various types of malicious code since 2000 has been the growth in the relative share of Trojans and a significant decline in that of viruses. This observation is confirmed by PandaLabs statistics on new malware threats that appeared in 2014 worldwide, which states that Trojans take the leading positions with a share of 68,84 % (fig. 1.2) [54].

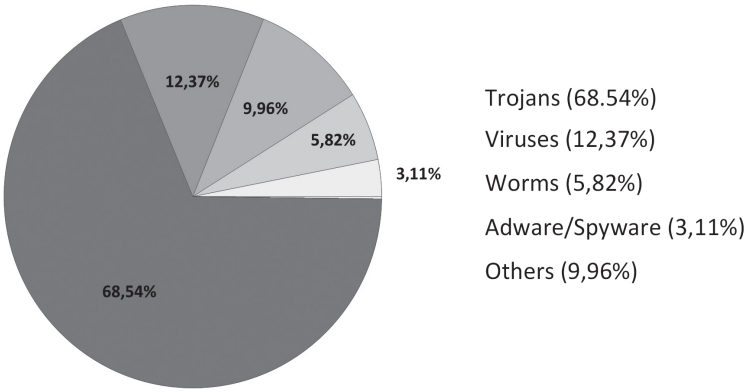

Fig. 1.2. Types of new malware created in 2014 according to PandaLabs statistics [55]

[52] Trojan.Neloweg [Electronic resource]. URL: http://www.symantec.com/security_response/writeup.jsp?docid=2012–020609–4221–99 (date of access: 31.07.2016).

[53] Bestuzhev D. Brazil: a country rich in banking Trojans [Electronic resource]. URL: http://www.securelist.com/en/analysis/204792084/Brazil_a_country_rich_in_banking_Trojans?print_mode=1 (date of access: 05.06.2013).

[54] PandaLabs Annual Report. 2014. P. 8.

[55] Ibid.

Spyware

One of the serious Internet banking hazards is associated with the software for espionage or Spyware. This is a type of computer programs that secretly, without the user knowledge or permission, collect user information or information about the user's computer and send it to the spyware author. A spyware program can follow and collect information on Internet use, the webpages visited, downloaded files, personal information such as user name and address; it can generate advertising pop ups, direct user to advertising sites or sometimes copy information the user enters via his/her computer keyboard, for example, sensitive financial information.

Spyware programs use the consumer's Internet connection to send information from the user's computer to another one without the user's knowledge and consent.

The different sub-types of spyware applications have different features. A common type of spyware is the one that follows browser activity, which is also known as Browser Hijacking. Here, for example, the browser search settings are changed. This allows the hackers to spy on sensitive information such as credit card details or log-in data for online banking, as well as e-mail and Internet addresses. With such data surfing profiles are created and offered for sale to spam sending services. An example for that is the spyware "CoolWebSearch". Programs of the keylogger type can also be integrated in spyware.

Keystroke logging (Keyloggers)

This hazard is associated with activities involving recording, unknowingly to the user, of the keyboard's keys he/she presses. Keyloggers programs can be viewed as spyware. There are various methods for such unauthorized activity, both software and hardware ones.

Software keyloggers are a type of program that interferes between the keyboard and the operating system, records and stores the pressed keys and then sends them to the operating system. Some keyloggers save the records on the hard disk of the computer that is being monitored, and others send them imperceptibly via the Internet to criminal servers. These data are filtered by the hackers for user names and passwords of Internet banking clients, credit card numbers and other personal and financial data.

Hardware keyloggers require direct physical access to the infected computer. They are used in cases when the installation of software

keylogger is either impossible or too complicated. Hardware keyloggers are switched directly between the keyboard and the computer and can be installed within seconds. Devices that record data in integrated memory (RAM, EPROM etc.) are later removed and read on another computer.

For mass users of Internet banking, predominant dangers are related to software keyloggers for intercepting pressed keys.

As a means of protection against hardware keyloggers a virtual keyboard can be used. The symbols entered on this keyboard cannot be intercepted and it is therefore recommended as a measure of protection. It is not, however, effective against software keyloggers.

To protect against software keyloggers Anti-Spyware programs need to be installed and regularly updated.

1.3.2. Identity theft

Bank information systems, including Internet banking systems in their bank side, are seriously protected and as a result, it is the client side of the systems that are an object of cybercrime attacks. Users are subjected to criminal attacks by evil- minded persons who possess the wide range of malware and technologies outlined above. Through phishing, vishing, pharming, spyware, keylogger programs and other types of malicious code hackers illegally gain confidential information like user names, passwords, credit card details and other, and thus Identity theft occurs. Illegally collected client identity data are afterwards subject to a sale at a secondary black market. For example, around 10 thousand credit card details are sold, including on the Internet, for between 1000 and 5000 US dollars, with huge packets of data changing hands.

After acquiring data for online access to client bank accounts, cyber criminals use the stolen user credentials for logging in the Internet banking systems and draining funds from accounts. The technology of scam involves unauthorized access to the user account by means of a stolen identity and transfer of funds to other accounts belonging to intermediaries, known as “money mules”. These people are tyFigally hired abroad, usually in Eastern Europe (Russia, Ukraine and other), and their task is to open a bank account using false names or their own names and documents (fig. 1.3) [56].

[56] Banksafeonline [Electronic resource]. URL: http://www.banksafeonline.org.uk/node/77 (date of access: 10.06.2013).

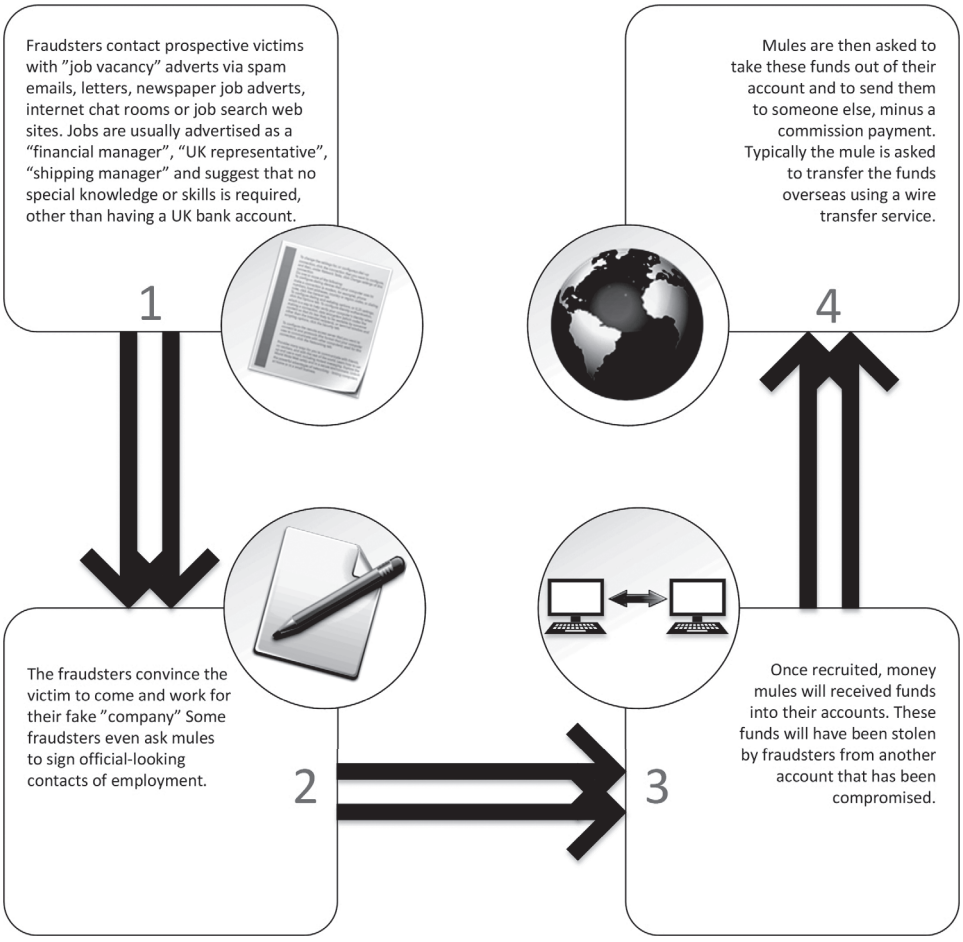

Fig. 1.3. Technology of fraud with money mules [57]

Funds from the compromised consumer accounts are transferred by the scammers into mules accounts and afterward mules send them to the criminals by means of systems for money transfer like Money Gramm and Western Union (operating without bank accounts), earning a commission for their work. Thus investigators of cybercrime can only get to the mules but not to the real perpetrators of financial fraud.

1.3.3. Methods for protection and authentication of users

Checking the client identity (authentication) and allowing the execution of electronic banking transactions (authorization) are a significant insepa-

[57] Banksafeonline [Electronic resource]. URL: http://www.banksafeonline.org.uk/node/77 (date of access: 10.06.2013).

rable component of Internet banking. As traditional paper-based methods and verifying client identity face-to-face reduce the speed and effectiveness of electronic transactions, financial institutions have adopted alternative authentication methods, including the use of:

- passwords and personal identification numbers (PIN);
- digital certificates using public key infrastructure (PKI);
- based on Microchip devices such as smart cards or other devices — tokens;
- database comparisons (e.g. fraud screening tools and programs);
- biometric identifiers.

The authentication methods listed above differ in the degree of security and reliability provided, as well as in the costs and complexity involved in their basic infrastructures. From this perspective, choice of the used methods should correspond to the risks for the product and service the access to which is controlled by them.

Authentication is a process of checking and confirming user identity. Users provide valid identification data, followed by one or more credentials (factors) for having their identity checked.

Authorization is a process of permitting someone to act or obtain something.

Existing methods of authentication include three basic "factors" [58]:

1. Something the user knows (knowledge) — such as PIN, password or passphrase.

2. Something the user has (ownership) — such as smartcard or token.

3. Something the user is (inherence) — such as fingerprints or voice characteristics.

Something the user knows

To this group of methods belongs the "Shared Secrets" method. Shared secrets are elements of information which are known or shared by both sides — that of the client and that of the authenticating institution. The most common examples of the shared secrets method are passwords, passphrase, and PIN codes. A number of studies show that users choose poor quality passwords and are easily persuaded to reveal them. More recent representatives of the shared secrets technique cover:

1) questions requiring specific user knowledge as an answer or;

2) user-selected image, chosen from a series of images provided.

[58] Federal Financial Institutions Examination Council: Guidance on Authentication in an Internet Banking Environment. 2005. October.

Shared secrets security can be increased through requiring a periodical change, since with "static secrets" (ones that never change) the risk of compromising grows with time. Using several shared secrets also provides growing security.

Something the user has

Hardware tokens fall in this group of authentication methods. Tokens are physical devices that can be:

USB token device — TyFigally it is as big as a house key; it is inserted directly in the computer's USB port and does not require the installation of special hardware on the user's computer. When the token is recognized, the client enters a password (a second authentication factor) in order to get access to the computer system. USB tokens are not easy to duplicate and are not subject to counterfeiting, so they are a relatively secure tool for storing sensitive data. The device can store digital certificates that can be used in public key infrastructures (PKI environment).

Smart card — has the appearance and size of a credit/debit card; contains an embedded computer chip. The chip contains a processor, an operating system as well as a read-only-memory (ROM) and random access memory (RAM). The microprocessor allows the smart card to store and process data; it enables software developers to use more reliable verification schemes. In order for the smart card to be used, it has to be placed in a compatible reader connected to the client's computer. In the process of authentication, if the smart card is recognized as valid (first factor), the user is invited to enter his/her password (second factor), so that the process of verification is completed. The smart card is difficult to double and counterfeit and is therefore a relatively secure instrument for storing sensitive or identification data.

Fig. 1.4. Smart card, that generates one-time passwords

Smart cards can be used in two variants — first, they can generate one-time passwords (for example: when the button is pressed, the card displays on the screen a 6-digit password (one-time password — OTP), which the user enters in the system and which is later checked by the authentication server of the bank (fig. 1.4)) or, second, the cards can store cryptographic keys.

In the second case, during the execution of a transaction, the user puts a chip card with a cryptographic key in the reader and enters a PIN code.

The key encrypts transaction data and they are next sent to the bank. The bank decodes data and checks the electronic signature. Only after data are confirmed is the transaction executed.

A major shortcoming of the second variant is that it requires the installation of hardware reader and its corresponding software driver on the user's computer.

A token device that generates passwords — this produces unique 6-or 8-digit access code, also known as one-time password (OTP), every time it is used. The token itself is not switched into the computer, but the one-time password appears on the device's small display. The client first enters his/her user name and the habitual password (first factor), followed by token-generated OTP (second factor). Client is authenticated if habitual password matches and the token-generated OTP matches the password of the bank's authentication server. A new password is usually generated every 60 or 30 seconds, i. e. its lifecycle is very short. OTP token can work for about 4 or 5 years (it is battery powered) and has to be replaced afterwards. Token devices are secure because verification is time-sensitive and synchronized. The random character, unpredictability and uniqueness of OTP passwords make it considerably more difficult for cyber criminals to intercept and use the passwords, obtained with, for example, keylogger type programs.

There is also a combination between a USB token device and a token device generating passwords.

Non-hardware-based scratch card with OTP — scratch cards are a cheaper "low-technology" version of OTP-generating token devices. Like a bingo card, this card usually contains figures and letters arranged in rows and columns, i. e. like a grid. The size of the card determines the number of cells in the grid. During the process of authentication the client first enters with his/her user name and password in the established manner.

If they match, the client has to enter, by way of a second factor for verification, the symbols contained in the randomly selected cells of the grid, i. e.

the client gets the coordinates of cells in the grid and he/she has to enter the symbols contained in them (fig. 1.5).

Hardware token devices are electronics-based, they can be damaged or develop a fault. Placing a grid of symbols on a wallet-size plastic card makes it durable and easy to carry around. This type of verification does not require special training and if the card is lost, it can be easily and relatively cheaply replaced.

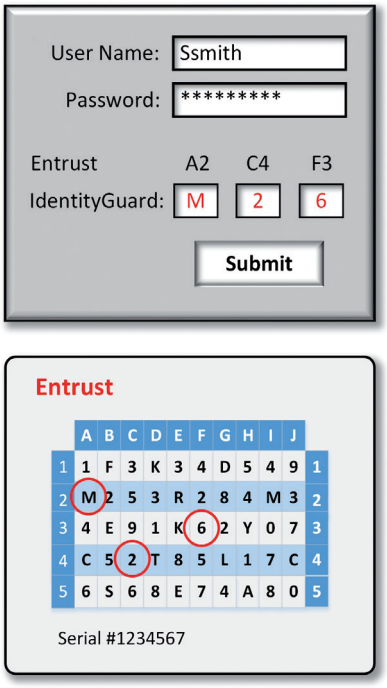

Fig. 1.5. Use of scratch card

Something the user is

Methods belonging to this group are based on user biometric characteristics and are defined as the best and most effective way to manage user verification. With the help of biometrics user identification and authentication is carried out on the basis of physiological characteristic like fingerprint recognition, iris and retina scan, face structure recognition, hand and finger geometry, voice or hand writing recognition. The most frequently applied biometric techniques are finger print recognition and face recognition. Unfortunately, the biometric method is expensive and is perceived by users as too annoying to use.

Different channel authentication

This method of authentication uses a channel that is different from the one the consumer uses to start the transaction. The separate channel certainly provides additional level of security, as a potential hacker has to cover both channels, which is impossible. The different channel is usually used as a second factor for OTP authentication.

The different channel for authentication can be: SMS (Short Message Service) to a mobile phone; e-mail; phone call; fax.

Banks most often send one-time passwords via SMS text. After the institution receives a transaction request, details of transaction, including a one-time password, are sent back to the user via an SMS and the user has to enter the password in order to confirm transaction (fig. 1.6) [59].

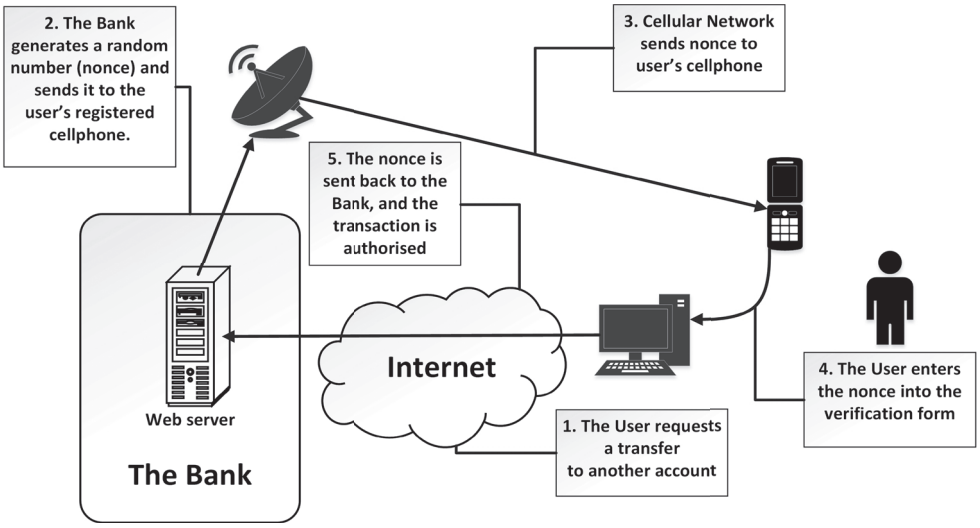

Fig. 1.6. Authentication with one-time code received via SMS [60]

Double factor and multi factor user authentication

The login process and work in the Internet banking system consists of several steps. In order to access the system the user needs to identify him/herself. Identification is achieved by presenting user's credentials. The next step — authentication, checks user identity. After that is authenticated, authorization defines what the user can see and execute in the application,

[59] Crypt.gen.nz [Electronic resource]. URL: http://www.crypt.gen.nz/papers/asb_netcode.html (date of access: 10.02.2015).

[60] Ibid.

i. e. authorization is the process of granting permission for performing particular activities, transactions, etc.

Difficulties for banks are associated mainly with the process of the secure confirmation of user identity, i. e. it is difficult for banks to define whether the banking transactions are performed by the real users or by malicious entities, who have stolen a user's personal data by means of malicious software.

To respond to these problems banks and Internet banking systems developers increase the number of factors with which user identity is verified, i. e. they apply the so called multi-factor authentication based on several authentication signs (factors). According to a 2007 survey commissioned by the European Commission [61] the necessary *minimal level of security* demands that web banking should apply *two-factor authentication* of the type "something that you know" (for example, a password) and "something that you have", as an additional factor. The mechanisms applied for enhancing security on the part of banks encompass the use of hardware token devices that generate one-time transactional codes of short-tie validity (from one to several minutes); electronic digital certificates based on chip cards; one-time codes that are sent to the user via SMS text and other. One of the conclusions of the survey, however, is that for the time being not all banks have raised the level of security of their web banking application to that of a two-factor authentication scheme. Such a scheme has not yet been generalized, i. e. regulatory bodies have not yet required its mandatory application by banks. Expectations are for the ECB to initiate legislative changes to impose such requirements pertaining to banking institutions within the EU and offering electronic channels based on Internet use.

Self-study questions

1. What does the fraudulent phishing technology mean?
2. How is vishing implemented?
3. How is pharming different from phishing?
4. What are the effects of malicious programs as Trojan horses?
5. What is the spyware "Browser Hijacking"?
6. How do the Keylogger programs work?
7. Please, give a definition of user authentication and authorization.
8. What is the group of authentication methods "Something the user knows" like? Please provide examples for them.

[61] Study on user identification methods in card payments, e-payments and mobile payments // European Commission — DG Internal Market. 2007. Nov. P. 3–4.

9. What are the methods of authentication that belong to the group methods "Something the user has"?
10. What is authentication like when using a different channel?

1.4. Online insurance

Over the last few years the major trend in the use of information and communication technologies in the insurance business has been the application of Internet-based solutions and remote channels for the sale of insurance products and services. Owing to the advance of online insurance, also known as e-insurance, clients are provided with multi-channel access to insurance products and services.

1.4.1. Nature and purpose of online insurance

E-insurance can be broadly defined as an application of the Internet and the information technologies related to the global network for offering and distribution of insurance products and services. In a more narrow sense E-insurance can be viewed as offering and negotiating insurance and respectively taking out insurance policies online [62]. Its scope covers payment and delivery of policies, claiming and processing damage, but, in some cases for technical reasons, and in some countries because of regulatory restrictions, these elements of the insurance process cannot be covered. Specifically, online insurance is defined as an interaction between an insurance company and its client that takes place during *the sale* of an insurance product, its *service* and *payment of indemnity* (in case an insured event occurs) when the interaction is performed entirely or mostly using the Internet [63].

Generally, in insurance theory there are two basic ways of placement insurance products: direct and indirect [64]. With the *direct* one provision of insurance products suggests a direct contact between the insurance company and the user of the insurance service. *Indirect placement* means including intermediaries in the channels for sale of insurance and these are called insurance

[62] Joshi V. C. E-finance — the future is here. 2nd ed. Los Angeles, 2010. P. 59.

[63] Parusheva S. Internet Insurance — Opportunities and Prospects for Development // Information Technologies. Scientific centre "Documentless information systems". University of Economics — Varna, 2008. No. 4.

[64] Iotov I., Boyan I. Basics of Insurance. Svishtov: Academic Publishing "Tsenov", 2004. P. 81.

brokers. They come as intermediary entities — firms that function as an individual business, but work for one, or, in most cases, more than one insurance company. The intermediary role of brokers is performed two ways — on the one hand they act as consultant, a proxy for the would-be insured, and on the other, they sell services, developed by insurers, and get paid a commission. Following the division of placement into direct and indirect, online insurance falls under the direct placement category. Here one finds the basic advantage for consumers — by selling insurance directly to clients, insurance companies save on the commission they habitually pay brokers, for example from 10 to 15 % in sales and conservation in the field of general insurance and between 35 to 100 % in life assurance.

When online insurance is at its broadest and fullest scope it includes:

1) calculating the insurance premium and defining the terms and conditions for its payment;

2) filling in an electronic application form to request insurance;

3) payment of insurance premium — as a one-time payment or periodical payments (deferred insurance premiums);

4) delivery of policy, verified by the insurer's electronic signature to the client, directly via the Internet;

5) service of the insurance contract throughout its duration (information exchange between an insurer and the insured client — producing reports upon the client's request, incl. statement of condition and the history of amendments of contracts, payments and compensations);

6) exchange of information between the insurer and the insured when the insured event occurs (claiming damage, etc.);

7) payment of insurance compensation by the insurer via the Internet when the insurance event occurs;

8) insurer's provision of other services and information to the client — consultancy, explanation of insurance terms and other.

As we mentioned above, for various reasons it is impossible to cover all these business processes in online insurance.

1.4.2. Peculiarities of insurance business that complicate online insurance

According to financial theory insurance business is much more conservative than banking. For this reason, there are factors and prerequisites in online insurance that further complicate the use of web technologies in insurance unlike electronic banking or Internet trading.

What comes first among these factors is the fact that *insurance products are less standardized,* are difficult to typify and respectively digitize. Second,

a number of insurance products are characterized by *considerable complexity*, which requires additional explanations and consultations with the respective insurance professionals. We should also add to the complications potential *hurdles on the part of the regulatory bodies* that supervise insurance business. An important specific feature of insurance, and particularly property insurance, is that, as a rule, *insurers have to perform an inspection of the insured property***,** no matter what it is — flats, villas, houses, vehicles or other property. Without an inspection, there is considerable likelihood of fraud and bad faith [65].

Remote sales of insurance products largely depend on how much consultation consumers will need. Insurance products that *are suitable for online distribution channel* are those that can be standardized within a framework and be described and assessed by means of fewer parameters, as well as the ones whose choice does not require considerable consultation. Research done by the leading Swiss reinsurance company Swiss Re has established the following: the more complicated the product is and the higher the value of the contract, the more willing the client is to pay for consultancy. Respectively, the product's larger consultancy component renders it less applicable for Internet distribution [66].

1.4.3. E-business models for Internet distribution of insurance products

E-insurance is based on the intensive application of Internet-based technologies, facilitating the building of new business models. These can be differentiated in several directions, the major ones being shown in Table 1.3 [67].

Insurance companies' websites

Remote sales of insurance products through *insurance companies' websites* are for the time being the most common e-business model in insurance.

At present all insurance companies have websites through which they realize 2 levels of using the global network:

- *providing information services,* which can be defined as offline or passive insurance, and
- *offering and a certain degree of selling an insurance product* (online insurance).

[65] Shishmanov Kr. Information systems and expertise assessments in insurance company. 2007. P. 42, 44.

[66] Swiss Re. The impact of e-business on the insurance industry: Pressure to adapt — chance to reinvent // Sigma. 2000. No. 5. P. 11.

[67] Ibid.

Table 1.3

Business models for Internet distribution

Type of model	Business model	Examples
Sites of insurance companies	Online sale of traditional products	www.ineas.com www.progressive.com www.aviva.co.uk www.renins.com
Financial portals	Portals for financial services and/or insurance	www.bankrate.com www.tescobank.com www.money.co.uk
Portals — points of sales	Web sites related to specific events	www.autobytel.com
Aggregators	Independent price comparisons	www.insure.com www.insweb.com www.insureme.com www.comparisonmarket.com www.ehealthinsurance.com

Over the last few years insurance companies have realized through their websites a minimum of the first level of Internet use — information to present the company and its products: information on the company, its profile and specialization (general insurance and/or life assurance), comprehensive information and description of products and services, possibilities for contact, office network and at best, possible calculation via electronic insurance calculator of the insurance premium concerning a particular subject (for example, Motor-Car Casco insurance). Some authors call this first level "an electronic business card" [68].

On the next, higher level are transactional sites, through which one can purchase, and afterwards service insurance products online — calculating the insurance premium (i. e. creating a particular offer/quote/), its payment, eventually making a damage claim and its processing, maintenance of the insurance contract and other. Some of the mentioned facilities are available on various insurers' websites or they are available to a varying degree.

Though not very common, there are websites that cover all the stages of signing and executing the insurance contract (the so called Full Service Websites) — from getting an offer quoting a concrete premium to claiming damage and being paid indemnity and making amendments on the contract. By way of example we can examine the website of the US company Kemper Di-

[68] Shishmanov Kr. Information systems and expertise assessments in insurance company. 2007. P. 38.

rect (a division of Kemper Corporation), specialized in car insurance and housing insurance [69].

In addition, on their websites some insurers provide up-to-date information about a similar product of competitive companies.

Financial portals

Another major e-business model is associated with *financial portals* offering quick standardized insurance products to Internet users under exceptionally competitive conditions.

Within the context of various electronic financial services, as a distribution channel the Internet may not be attractive enough, should consumers need to familiarize themselves with different separate websites in case they need several financial products. The major advantage of financial portals consists of the fact that while using other services financial portals provide, consumers may also take advantage of the insurance offered. A financial portal relies on its established brand name, which attracts a constant stream of visitors, and offers a wide range of financial products and services, including insurance ones. Regularly using a financial service of a different kind, a consumer happily goes for buying insurance online, too. In table 1.3 examples are given of several portals, like www.bankrate.com, www.money.co.uk and other.

Point-of-sale portals

Point-of-sale portals are connected with purchasing insurance as a result of another event that involves additionally buying such a service.

Point-of-sale portals are the Internet locations where it is possible to buy an insurance product because of another event that demands that such service be added.

Point-of-sale portals carry out product marketing of a certain insurance according to a definite thematic trend of a site's online sales, for example real estate, cars, etc. In these cases the initiative for taking out insurance comes from the seller and not from the client him/herself [70]. Sites with suitable thematic specialization for initiating selling insurance are associated with themes like Retirement, Career Change, Wedding and other.

Aggregators

Aggregators work on the basis of an electronic business model, by means of which they offer clients the possibility to compare online insurance offers

[69] Kemper Direct [Electronic resource]. URL: https://direct.kemper.com/home.aspx (date of access: 31.07.2017).

[70] Swiss Re. The impact of e-business on the insurance industry: Pressure to adapt — chance to reinvent // Sigma. 2000. No. 5. P. 15.

by various insurance companies. The model is applied mostly in specialized insurance sites, as well as in insurance brokers' websites. Usually apart from the chance to compare various insurers' offers, aggregators also provide general information about the insurance product, which brings about greater knowledge on the part of consumers and a rise of their insurance culture. Aggregates often provide educating tools, such as a glossary, learning center (for example Learning Center in InsWeb and other sites), etc. Some of the insurance portals are narrowly specialized in a particular insurance segment, such as www.ehealthinsurance.com, which provides medical insurance offers based on the leading companies in this field [71].

Giving consumers the opportunity to compare in one place, in one window, the peculiarities of offers by a multitude of insurers and choose the most advantageous one, aggregator sites enjoy exponential growth, according to assessment made by Infosys company. Its surveys reveal that aggregator-generated sales account for over 50 % of the total of online insurance sales.

1.4.4. Applicability of online insurance and its reception by consumers

Depending on its object, insurance is divided into two great fields — general insurance and personal or life insurance.

For remote sales it is better to offer general insurance policies, in particular the division of *car insurance* — of motor vehicles: Third Party Motor Liability Insurance, Casco Insurance, Green Card Insurance to be taken out before driving abroad; *property insurance* — housing (apartments, houses, villas and other), various personal liabilities (for example, Professional Indemnity Insurance for persons providing particular professional services and other). From the *personal insurance* category what is suitable to offer is Accident Insurance, Travel Insurance, Health Insurance, Term Life Insurance and other.

Car insurance and in particular Third Party Motor Liability Insurance account for the largest share of online insurance. According to experts, 85 % of all insurance bought on the global network worldwide are Third Party Motor Liability Insurance.

According to the result of a recent study of Vienna University, performed in cooperation with the consultancy companies Mount Onyx and TCI Consult, published in mid-2012, a conclusion is made for a rise in online insurance companies in Europe [72]. Online distribution channels in Europe were ana-

[71] Health Insurance Companies [Electronic resource]. URL: https://www.ehealthinsurance.com/health-insurance-companies (date of access: 20.02.2015)

[72] Finsinger J., Johannes O. Best Practice Report. Direct & Low-cost Insurance in Europe. MOUNT ONYX. University of Vienna. TCI Consult. Vienna, 2012.

lyzed and a survey was carried out in over 30 countries and of over 200 insurance companies. It is reported that direct insurance sold via the Internet and over the telephone accounts for a turnover of 80 billion EUR (gross premium income) in general and life assurance in Europe.

Data on the direct channels in European insurance reveal significant differences regarding consumer reception. The authors of the study divide countries into three groups according to the market share of online insurance within general insurance: *mature countries* with a market share of over 10 %, like UK; *developing countries* with a market share of between 1.1 % и 10 %, like Spain; *emerging countries* with a market share of 1.0 % and less, like Russia.

Over a 10-year period (from 2000 to 2010) direct channels in Europe demonstrated a much higher growth rate compared to that of the traditional market for general insurance (26 % against 7 % respectively).

The UK can be mentioned as an example of the serious presence and significance of direct channels in insurance. The country is in the mature market category and there the share of clients buying Third Party Motor Liability Insurance remotely is over 25 %. Other sources (Google's Consumer Barometer [73]) also provide considerably higher ratings for British consumers' perception of online insurance — the percentage of consumers buying online car insurance is estimated at 58 %, and with housing insurance — at 52 %, i. e. considerably higher shares.

Self-study questions

1. Please, give a definition of Internet insurance.
2. What does Internet insurance include in its most complete coverage?
3. What are the characteristics and specifics of the insurance business that complicate the Internet insurance?
4. Which insurance products are suitable for sale via the Internet insurance?
5. What are the levels through which insurance companies use their websites?
6. What is the difference between online and offline insurance?
7. What are the benefits of financial portals compared to other e-business models for insurances?
8. What is the role of aggregators in online insurance?
9. How can countries be divided in terms of their market share in online insurance?
10. How can the state of Internet insurance in Bulgaria be assessed?

[73] The Consumer Barometer [Electronic resource]. URL: http://www.consumerbarometer.com (date of access: 01.08.2016).

2. E-GOVERNMENT

2.1. Administrative processes

For studying of part 2.1 it is recommended to use the sources below[74].

2.1.1. Nature of the administrative process

Administrative processes are a sequence of the actions of specialists and employees of the public administration, who perform functions of the state authority and the local government. These actions have to be formally regulated, so that preliminary fixing, creating and using administrative information are possible. Every administrative process requires the provision of established administrative regulations together with rules to define the roles of executors.

The exchange of official information within the administrative apparatus practically results from the specialized information sectors, including the systems of various departments. Here we should also include the exchange between the various levels of administrative government (national, regional, local) as well as between the information systems of departments, citizens and organizations. Administrative processes need a "formalized" language that is clear to both people and computer systems and is meant to describe the sequence of actions and the documenting of their implementation. This allows for describing as specifications (scripts) the long chains of service passing through the various departments and levels of administrative and state

[74] Kiskinov V. Electronic government / V. Kiskinov. SIBI. Sofia. 2003.

Лекции по праву [Electronic resource]. URL: http://www.bg-pravo.com/2009/11/32.html (date of access: 01.08.2016).

Civil Servants Act: effective from 27.08.1999. // Official Gazette. 1999. Is. 67. 27 July.

government. The already described interdepartmental processes should not be included. Specifications allow for organizing discussions between various offices, as well as for improving operativeness and developing the shortest and most effective administrative processes possible. It is also necessary to foresee the responsibility of various departments for documenting the activities (operations) participating in the administrative process.

Unlike functional description, the formal description of administrative processes allows for the identification and elimination of contradictions (conflict of interest) which impact the transparency and accountability of the process. Naturally, when there is conflict of interest it is impossible to show objectivity in management decision making. With process description operativenesss can grow manifold if electronic documenting is used in the administrative process. Administrative processes during the execution of which the official information is documented using the instruments of information-and-communication technology are called electronic administrative processes and the regulations defining them — electronic administrative regulations.

The rules for electronic execution of administrative processes are, to a substantial degree, defined by the computer applications that implement administrative logics. This is an additional argument in favour of the inclusion of results or computer applications into the regulatory base along with the traditional specifications and instructions. For electronic administrative processes electronic administrative regulations encompass not only regulatory enactments but also the software tools designed for their implementation. In the electronic administrative processes not only means of informatization are used but complex information-and-communication instruments, as data resulting from documenting are subject to being passed electronically among citizens and administration and from one administrator to another. Thus one of the effects of the reforms carried out is reducing the complexity of participation in administrative processes for the state authorities, the citizens and the business alike. This, however, cannot occur automatically with the conversion to electronic instruments of documenting. There seems to arise a strive for increasing the scope and complexity of documenting procedures. Therefore, the transition to electronic administrative processe does not translate as an automatic reduction of the administrative burden for citizens and organizations. The complexity of the processes which citizens and organizations also have to take part in, may grow even further. What is necessary is a set of political decisions to guarantee reducing the administrative burden during the transition to electronic administrative processes.

Administrative processes will be transparent, provided there are regulations and unambiguous descriptions in a formalized language. It is mandatory that administrative processes be controlled when official (documented) information is useed. Operativeness is provided on the basis of electronic transfer of official information and also through rationalizing the sequence of activities of administrative specialists.

New institutions (already in the electronic and not in the paper-based public administration) have been provided with electronic documenting, electronic access for citizens and organizations to state information. Electronic administrative processes will possibly be sabotaged by bureaucracy, so it is necessary to act in order to ensure exceptional control. It is a matter of conformity of administrative regulations to the principles and requirements set in the regulatory basis. Regulations should refer to the administrative document turnover so that they ensure access for the government, for citizens checking official information. Regulations are used in the course of administrative processes, as well as in the very sequence of actions connected with government decision-making.

Such control, complementing the state authorities' internal control and the control on the part of representative authorities, should be exercised by independent external audit. Then it will not be necessary for the number of state-employed examiners to grow and it will be fully possible to follow the principal rule of citizens assuming control over their state. The external (private) auditor is unlikely to zealously defend "solidarity" as is often the case with the state-employed examiner. Already there are similar precedents in banks, organizations, enterprises and other, which are checked by private auditors. It is fully possible for this practice to spread across all typ es of administrative activity. This audit should be funded by the state budget, but auditors should be selected according to the principle of open competitions. Naturally, an audit, as a measure of control (aimed at finding out inconsistencies between requirements and enactments), should be tied up with actual sanctions in case irregularities are disclosed. The presence of an external audit substantially raises responsibility and also helps to ensure the necessary transparency and review efficiency. It is exactly the existence of an independent audit (and one that is external to the state apparatus) that makes the other basic institutes of government efficient.

In order to create a transparent and effective electronic government, there have to be transformed the administrative processes citizens face on a daily basis and which are not easily controllable because of the proliferation of sectors such as:

- "Personal filing" sector for the population and the duties that entail, "Registration" sector, "Targeted public benefits" sector, "Social services" sector, etc.
- Sectors for Reporting Entities and their liabilities to the state.
- Sectors for Cadastral Filing and Reporting of Vehicles.
- Regulatory basis, including various types of projects.
- Filing of court rulings and administrative procedures of citizens and legal entities in courts.
- Relations in the course of the budget process, etc.

For each of these sectors what is needed above all is analysis of and amendments in the legislative initiative in order to:

- precisely define the object of filing;
- remove the current restrictions generated by the mandatory paper-document flow and paper-based information exchange in the course of administrative processes;
- prescribe requirements for the new administrative processes, already taking into account the electronic form of information exchange;
- to further define information regulations about what to present as information available to the public, as well as defining other specifics of using official information;
- define the necessary budget funding and assessment of the regulatory burden that results from the need to implement information-and-communication technologies to support electronic filing, administrative processes, access to information and audit.

The electronic provision of these administrative process and the remaining ones, inevitably calls for administrative re-engineering, combined with planning the resources necessary. The need for re-engineering is based on the substantial problems associated with the impossibility of pilot implementation without preliminary amendments in the legislation and the impossibility of new legislative initiatives without preliminary being clear about the information-and-communication technological solutions. Forms of administrative re-engineering that have performed very well in developed countries contain the following mode of action:

1. Administrative re-engineering is carried out in the functional institutions of the government (condition, licensing, registration, etc.) by creating:

1) a package of legislative amendments — on the respective functions of government, taking into consideration the transition to an institution of the electronic government;

2) technical standards defining the use of metadata and prototypes;
3) a filing system prototypes which confirm the efficiency of technical standards and their conformity to the project for legislative amendments;
4) evaluation of the resources necessary for the transition to the new administrative processes all over the country;
5) methodological materials providing the conversion to new procedures.

2. The package of legislative initiatives takes effect while simultaneously provisions are set aside for the implementation of the new electronic administrative processes of institutions and dedlines are fixed for the following to be carried out:

1) creation and/or change of the necessary software provision;
2) adapting procedures (according to regulations) connected with administrative processes;
3) transferring the current document turnover in the required formats (where necessary);
4) combining the interaction between the infrastructure organizations of the electronic government;
5) training for the civil servants in charge of particular operations within the administrative processes and coordination of their execution;
6) explaining and clarifying the nature of the upcoming transformations to citizens and organizations.

These exactly should be the procedures of the upcoming administrative re-engineering, and not just local changes in administrative processes by introducing certain software provision in the course of informatization.

2.1.2. Structure of the process

The major problem in the building of electronic government consists in the fact that territorial and sectoral information systems and resources are not integrated, and their corresponding departmental networks do not form a unified communication structure in the Internet, nor do they communicate with one another. As a result of disintegration there is duplication, patchy automation, closed information resources, isolated information flows, unestablished horizontal links, etc. Building departmental networks at the cost of huge budgetary funds and their closed usage do not create a unified environment for electronic exchange of documents. The same holds true for sectoral databases. Eventually, what happens is a frequent need for additional work on these networks' technical components and as a result, the aggregate cost of the information systems and resources used rises considerably. Existing models for creation of information systems in the bodies of state govern-

ance and the local government, in particular sectors and spheres are predominantly used as automation of functions based on organization of specialized jobs. Such automation, however, as is the case with the processes of processing document flow of the previous kind, sometimes results in another, and even less effective, type of work. The senior management overload of current decision-making (due to multi-departmentalization/multi-linkedness) on the issues of document turnover that only administrative specialists worry about, merely results in worsening the quality of service. What is more, the need arises for a double amount of work on the screen and paper-based forms, more time is spent on scanning and printing correspondence. Meanwhile, however, the very efficient instrument for information systems integration, analysis and management-decision making — the service-oriented systems — are predominantly used for data presentation and preparation of prototypes. No substantial effect is achieved by the implementation of local information systems from the viewpoint of ensuring the socio-economic development of one or another division of public administration or for improving the living standards of the population.

It is necessary to develop a quality model for creating electroning governance which should create real conditions for integrated use of information systems and resources in public administration. The building of such a model passes through the following stages:

During *the first stage* of the model implementation it is necessary to solve the problems with servicing the processes of the strategic management of administrative territories, with the tasks including certain parameters of effective management of business processes. In order to achieve a result, one has to analyse the functions of each division of administration, internal and external interactions, criteria for effectiveness of divisions, and above all, the services resulting from their activities. This stage allows for the definition of external objects and for the development of technical requirements before information systems.

During *the second stage* it is necessary to create target modules through which to form and analyse in a real time mode the databases for the management report, along with balanced scorecard for the activity of the center of responsibility.

Modules could be as follows:

Module for control by objects — in the housing and communal services, in the territorial planning, in the social, legal and other spheres. The module comprises distributed databases for budget financial management. It is also

designed to monitor the budget resources used, as well as for analysis of the activity of budget organizations and enterprises with state and municipal participation. The organizational structure of this module corresponds to the economic and financial management, to accounting and operational reporting.

Module for analysis of activity — it is based on reliable data entered. It provides cluster document analysis and employs interactive methods for gatherinf statistical data. It allows for the implementation of monitoring and analysis of socio-economic processes by territories. It defines the efficiency of the budget funds used. It is feasible that the module integrates a system for document turnover with information-search, information-advice, and geo information systems (whereby leading technologies can be used, such as push-to-talk — press for a conversation, WiFi — Wireless Fidelity — a wireless technology for data transfer, GPS — Global Positioning System and other).

Module for business processes optimization — it provides the intellectual routing of queries and electronic document flow, includes contact centres, interactive reference system and voice fax-servers. Within the structure of the module there should be unified processes from the IT sector, management of strategic development, accounting, human resources, finance management and economics.

Module for personnel motivation — contains a system for staff planning and allows for the organization of interactive inquiries to the population and the specialists, for testing and training civil servants and municipal employees. As an organizational structure it corresponds to Human Resources.

Module for knowledge management — it provides the implementation of electronic document turnover by accumulating documents in an electronic library in the mode of burst capture documents, use of systems for stream scanning and barcode identification of documents, applying full-text search, aggregating report data from lower levels of government and sectoral spheres, subswitching to external databases. The module includes a system for integrated document management and record management. The system allows for the organization of synchronized report on paper-based and electronic copies of documents. Automated tools for withdrawal and retrieval of procedures are applied.

Module for preparation of decisions — for developing a strategy and management of changes. It integrates databases of tyFigal procedures and expert systems models. As an organizational structure it corresponds to economic management and strategic management.

Module for implementation of decisions and control — it serves the automated complexes of electronic document turnover, corporate software pro-

vision, team work and it also provides automatic answers brought together in the Web portal. As an organizational structure it corresponds to the secretariat and head office.

During *the third stage* of the creation of the model for electronic government the formation of necessary information resources and infrastructure takes place. The study of the functions of territorial government makes it possible to differentiate four basic (primary) information blocks of the unified information spave of the region. These are "Territory" (electronic maps, schemes and plans, including engineering communications, transport and other networks), "Real estate" (buildings, facilities, residential and non-residential premises), "Population" and "Legal entities". In order to rule out any duplication of information, to prevent mistakes and reduce costs involved in checking data, it is necessary to dedicate a single credible source of basic information — a nod for registration of individuals and legal entities and real estate. All the remining informational databases are constituted using those three blocks. Such databases are created to solve consumer tasks within the separate sectors and they constitute the middle-tier of databases. Accuracy and the degree of detailization should be enough to execute the task set (payments of rent and housing and communal services, subsidies and grants, measuring plots during preparations for construction, etc). At the highest level (Head administration and deputies) a system is built for facilitating decision-making and an expert information system, both operating with complexes of data aggregated at a lower level by means of specialized gateway filters. Thus, in accordance with the tasks solved, one raises the degree of aggregating, the complex character of information and the resulting indicators while information moves to the top of management hierarchy. Here it is necessary to define a circle of officers to work with particular indicators at the level of head of sector, management levels, head administration and deputies.

During *the fourth stage* there is performed the building of a unified information portal — a resource of power that is "spread" over the Internet and departmental networks. The process of creating the portal can be crried out on a large scale or with the help of individual pilot projects in various spheres. While developing the portal, one has to take into consideration the possibility for organizing access via portable devices. For instance, with an SMS message taxpayers can confirm the correctness of their income tax returns or vote in elections.

The major tools for the protection of the confidentiality of information in the course of inter-departmental exchange via the open communication chan-

nels and accepting citizens' electronic documents through the portal are systems for data encryption. Smart cards can be used as an instrument of integration in the portal. Besides, a basis function is integration with external systems, which includes a system for accounts of budget transfers, a system for base changes in tax and budget legislation, and other.

For the complex solution of the tasks of integration, increase in the functional facilities of the systems and their scaling, it is necessary to set up specialized enterprises — developers of information projects. They should be commissioned to achieve software provision and specialized basic functions of the electronic government. One of the functions of such an organization should be the management of automated work stations (Thin Client) for the organs of executive power and budget organizations, which should replace the current practice of buying hardware that is bound to quickly become outdated. Such a form of realization of the process (based on outsourcing or leasing) of building an information system has been implemented in the developed countries and it has a number of advantages. Above all, it eliminates the time lag between changing the software provision requirements and the time necessary for updating the hardware tools.

Developers collect and analyse the solutions offered on the IT market, carry out a "stock count" of existing information systems and resources, suggest projects for informatization, obtain offers and requests for the general system part of information systems and administrative subjects, by municipal organizations, territorial divisions of sectoral complexes, by coordinating councils and expert councils of head administrations, ministries and departments. They sum up, analyse circumstances and, if necessary, refer to expert organizations. When they complete the development of the system, developers organize the reception and delivery of an information system and resources in test, trial and commercial exploitation.

Existing information systems, built on budget funds, can be registered as core capital. The systems that developers create are designed for integration and ensuring control over the existing ones and for the implementation of a unified strategy in the field of informatization. The current financing of developers is provided through paid services offered to the public and to organizations (broad band television, digital telephony, Internet access and other), as well as by the authorities (for developing technical assignments, projects, expert reports, organization of competitions and other), as well as from the commercial use of infrastructural elements. As a whole, such organization helps to integrate territorial and sectoral information systems, to avoid du-

plication of data and the corresponding budget costs, to ensure reliable exploitation and the necessary level of security of the information-and-communication infrastructure of the electronic government.

The fifth and sixth stages related to the building of electronic government are the management of queries, changes and results. A flexible import of corrections is envisaged in the developed administrative processes, software complexes and return to a previous stage. During those two stages a transition is achieved to process methods of management. Methods are oriented to effective coordination of the management systems — along horizontal and vertical links, between the subdivisions of authorities as well as with external organizations. The management of changes allows organizations to constantly progress. It allows them to systematically refute their doubts in their own efficiency through the usable technologies and the models for decision-making. These organizations can get rid of superfluous bureaucratic procedures by adopting, adapting and implementing new ideas and technologies. The model of realization of the electronic government via developers is the foundation of software and the concept of specialized enterprises which create the affiliate structures of service-oriented architecture.

2.1.3. Information process

Information process is the process that functions by means of regulated operations (actions) performed on data in the course of which the composition, content or form of data can be preserved or transformed and presented in their finished form — as information. Processes involved in information are ubiquitous, i. e. they exist and act everywhere: in human relationships, in Nature, in the technical environment, and in public administration alike. A human perceives information through his/her senses, he/she stores and processes it using the brain and the cenral nervous system. The essence of the human mental activity is concentrated in the ways of processing information. A human thinks, calculates, talks, listens, reads, writes, draws, etc., whereby the individual always interacts with information.

Technical devices perform the role of an intermediary in the communication with information that takes place between people, institutions and the surrounding environment. Without the help of technical devices it is impossible to obtain certain types of information that are inaccessible for direct reception by a human. A human is unable to quickly process huge arrays of data, to transmit information over long distances or store it for the future generations.

A number of examples of information processes can be listed, but among the multitude, the following can be distinguished as the essential ones: receiving, processing, transmitting, storing. The above mentioned processes are basic processes. Their execution generates other information processes and sub-processes. Thus, for example, receiving information can be associated with its occurrence, its search, accumulation, systematization, etc. While information is transmitted, it is necessary to ensure its protection from destructive impacts.

All processes require a certain form of representation of information, which is defined by a process called encryption. This process accompanies all the remaining ones and is the link between them. Information processes are not isolated, but they run in cycles, in unity and interconnection with one another.

Receiving information. In receiving information the leading role is played by the method of perception and the form in which information is presented. Very often these information procedures are defined by the recipient and, more exactly, by his/her abilities to receive it. It is useless, for example, to transmit information in the form of sounds, to an individual who is unable to hear. Information is necessary to humans not per se, but in the right time, so that a human can get orientation in the surrounding environment and make decisions for further actions. Here an important role is played by the properties of information. A human creates instruments and technical devices which allow him/her to receive information that is inaccessible to his/her senses and processing capacity. Technically, an analogue of the human senses are the respective sensor devices, detectors, microprocessor systems and other. Information received is input information, and, as it is known in computer technology, special devices are used for inputting information, such as a keyboard, scanner, radio, microphone, mouse and other.

Processing information. Processing is the transformation of information — alteration of its content or form of presentation. Usually the changes in the contents of information are expressed as editing, mathematical calculations, logical inferences and other actions. Arranging, encryption and translating into another language are considered to be changes in the form of information. Encryption is also one of the variants of information processing. Processing of information can be performed formally, according to rules prescribed in advance or according to a set algorythm. It is also possible to apply euristc approaches, whereby a new syste of actions is created or a new, so far unknown, law is discovered in the object that is being studied.

Transmitting information. Information is transmitted along communication channels and it is directed from the source to the recipient as a sequence of signals making up a communication message. The physical meaning of the signal may not coincide with the meaning of the transmitted information. Source information is converted into a type and form that is accessible to the communication channel, and after that is decoded into a type and form that is understandable for the recipient. To achieve reciprocity, a preliminary agreement on the meaning of symbols must be reached.

During the process of transmission, information may be damaged or lost as a result of various impacts. The reasons for them can be both technical (overload, vibrations, electric and magnetic field, a drop in temperature, aggressive environment) and resulting from human interference/intrusion.

Storing information. Information cannot exist without its carrier — an environment that directly stores information. Therefore the term 'carrier' should be interpreted as 'having the inherent quality', that is, containing in itself and not transferring information. What could a carrier be? Any object (but for electronic processing it is a more specific one — electromagnetic, light, sound) or a different state of a substance. Information can be in the object itself, or recorded on an external carrier — recorded on paper, magnetic tape, Figture, photo- and film-document, etc. In order to retrieve information from an external carrier, additional instruments, ty-Figally technical ones, are necessary. For instance, in order to receive information contained in magnetic environment, the respective reader is needed. Computer technology provides numerous facilities for storing information in a compact form: electronic, electromagnetic, optical carriers. They are characterized by their information capacity, time for access to information, reliability of storage, uptime.

Systematization of information processes into a unified information system is necessary to begin by performing a qualitative analysis on the information content of the studied object. Information content can be divided into internal and external. Internal information brings together the following information:

1) primary documents;
2) internal document flow (paper and electronic), including orders and instructions given by the director or manager of each division;
3) operational and accounting reporting for present or passed periods;
4) analysis and control of financial and economic activity;
5) other data.

The quality of the internal information content depends on the organizational structure of the governance, the rational allocation of functional duties, reliable accountability, sufficient efficiency of the document turnover. Internal information content is formed by its own sources of information, which can be checked for comprehensiveness and credibility.

The variety of external information and its sources are basically the following:

1) normative acts/enactments;
2) sectoral normative-and-reference type of documents;
3) sectoral reports, based on market sales;
4) state of the economy;
5) advertising, information for the public and organizations;
6) expert and consultant conclusions.

It is necessary to bear in mind the following essential problems that arise in the creation of the external information content:

1. Lack of authenticity of information. Part of information (especially in certain management information systems and on the Internet) may be of dubious character and in some cases even invalid;

2. Incomplete information. The source of information may deliberately or inadvertently present not the whole information, but just a proportion of it;

3. Contradictory information. Information from different sources may differ, and besides, it may be difficult to identify the real information content;

4. Redundancy of information. In order to increase the speed of information processing, some data have to duplicate, but this should occur in a minimal degree;

5. Heterogeneous information. Information from different sources arrives in a different format.

For unification of information in view of long-term use, storage and processing via a unified technology, information needs to be converted. To form and maintain information in an active state is not a simple task. It can be solved only on condition there are normally functioning information flows, that have been covered by a modern automated government information system.

Self-study questions

1. What is the nature of the administrative process?
2. What is the nature of the electronic execution of administrative processes?
3. Which are the criteria for transparency in administrative processes?
4. What are the forms of control to provide electronic documentation?

5. What kind of organizational actions should be taken to transform administrative processes?
6. What are the objectives when amending the legislative initiative?
7. What is the purpose of the administrative re-engineering?
8. What are the forms of administrative re-engineering?
9. What is the purpose of building a unified communication structure of the administrative process?
10. What are the stages of the information process?

2.2. Administrating an electronic government Website

For studying of part 2.2 it is recommended to use the sources below [75].

2.2.1. Institutional site

Abilities of Internet technologies find an ever larger application in the public administration work. It is exactly for this reason that the number of institutional sites is growing and more and more state and municipal sectors are orientated to this type of websites. An institutional site differs from the business website mostly in that it has several areas of application aimed at different target groups. TyFigally an institutional site consists of three such areas (zones): available to the public, internal and administartaing. The zone available to the public is designed to serve all Internet users and in particular citizens and organizations who require services from the public administration. The basic difference between this zone and and similar zones in other kind of sites consists in its purpose. Whereas in other sites (especially in electronic shops) the aim is to maximally retain the client's attention, so that he/she orders goods, the idea of an institutional site is to maximally quickly serve the respective citizen or representative of an organization. Thus the user is satisfied with the service and, on the other hand less traffic takes place, which allows for the number of users served growing.

[75] E-Government Act: effective from 13.06.2008 // Official Gazette. 2007. Is. 46.

Holms D. E-government strategies. Klasika i stil / D. Holms. Sofia, 2002.

Kiskinov V. Electronic government / V. Kiskinov. SIBI. Sofia, 2003.

E-governement in Bulgaria [Electronic resource]. URL: http://psc.egov.bg/documents/10180/21521/Obshta_Strategia_eGovernment_2011_2015.pdf (date of access: 01.08.2016).

Petrova M. Building E-Guvernance through reforms: the bulgarian experience [Electronic resource] / M. Petrova. URL: http://www.mtitc.government.bg/upload/docs/E_GOV_Conception_for_publishing__2_.pdf (date of access: 18.11.2013).

The internal area is aimed at the civil servants and specialists who can only use it with passwords. In this area the results are prepared for services about which decisions must be made by state and municipal specialists. Usually such decisions are made when events and circumstances occur for which the relevant legislative and regulatory measures have not been envisaged. Often such events also affect the document turnover in several administrative sectors, which sometimes calls for the direct participation of administrative specialists in the preparation of the respective decisions. Therefore this zone is only accessible by means of passwords, but, on the other hand, a possibility is provided to citizens and representatives of organization to trace the movement of their requests through administrative sectors and how the request has been executed.

The administrating area is at the disposal of IT specialists called website administrators. An administrator ensures the maintenance and testing of site, as well as its SEO optimization (Search Engine Optimization — optimization for search engines). Apart from that, the administrator selects key words, announces (promotes) the new services and facilities of the site, maintains the news section, etc. In many cases administrating guarantees the normal functioning of the site. After the official start of the website the administrator analyses the site's behaviour. He/she identifies a possibility for standardization and universalization of the user interface, suggests variants for improving the design, maintains and, if necessary, changes the communication plan of the site, etc.

An administrator is a highly-organized specialist with a wide range of knowledge in various spheres of human life. Under certain circumstances it is the site administrator that the execution of a particular service depends on, even if there are programming inaccuracies. He/she ensures the normal work of the site and feedback from developers. Should there be a potential for improving the site, the admin informs the stakeholders. The correctly developed site allows the addition of more fragments and services, if necessary. This leads to expanding the site structure and to an increase in its capacity.

Several aims are pursued in creating an institutional site. The first one is to provide information for the administrative unit in the Internet space, so that it is accessible to the public and organizations. In this the institutional site does not differ from tyFigal sites. The second aim is to create low-cost and effective routines, i. e. automatic procedures (for instance, the drawing up of a document that does not require special decision-making). This also holds true for internal administrative messages, document flow and a number of reporting forms that can be implemented via Web interface. This is

particularlyly effective if the administration has several branches in different regions. The third aim is to provide service results via the Internet, without a document, and in case of need (for example, the current status of a given organization is established should the interested party needs it, without being necessary to issue the respective document). For this purpose a special area is created in the site, with the necessary functions for access and confirmation, but without it being necessary to apply the respective documents.

Creating an institutional site takes a gert deal of intensive preparation and routine while it is being realized. Usually few ready elements can be borrowed for the universal preparation of the site. Therefore, as a rule, developing an institutional site for the purposes of the electronic government in Bulgaria has to be commissioned either to a team that is highly-qualified in the field of electronic government, or to be granted (as well as the overall project for building an electronic government) to a Web company of international reputation and experience in this respect. This fully justifies the costs (see Estonia, Colombia and other countries), since the creation and development of the site, as is the case with the entire project, demands that many factors are envisaged, such as the peculiarities of the services, the audience, the style of work of administrative specialists, etc. Besides, the guideline for expanding the site's capacity is of particular importance. Thus, in order for these issues to be successfully resolved, we really need a Web company with a team of professionals. It should be a team that could ensure not so much the normal functioning of such a complicated project, but rather envisage, as early as at the developing stage, the possibilities for its further development.

Practically all organs of state authority also maintain departmental sites on the Internet and publish general information about their activities. Within the framework of the implementation of administrative reform, there are described functions and processes of the state governance and the local government, individual projects are realized for reorganization and optimization of administrative processes in individual departments. Along with that, so far the results from the implementation of the information-and-communication technologies in the state authority bodies are of predominantly intradepartmental character. This, in turn, does not allow for the expansion of inter-departmental interaction and a higher quality of the administrative services provided to citizens and organizations. Many of the national authorities do not have complex programs for implementation of information and communication technologies or programs for improving their work. This nearly always leads to unforeseen expenses. A major part of budget costs are incurred by

the purchase and installation of computer and network equipment. This, in general, testifies of an inadeuate level of development and use of applied information systems. The conclusion to be made is that it is the technological approach that dominates in the solutions to informatization systems. The single, unified portal of institutional websites providing interaction with the organs of state authority with their institutions, as well as with organizations and citizens within the framework of provided administrative services is still at the stage of initial formation.

The level of professional training of specialists from the organs of local and state authorities in the field of modern information and communication technologies is not high enough. This level is crucial for the implementation of ever more sophisticated and complex solutions in the work of public administration. The occurring situation does not allow for the provision of a new quality level of state governance and services to the public and organizations on the basis of modern information and communication technologies. The effectiveness of the budget spending on the development of a national information system has dropped considerably. The building of an electronic government requires the implementation of coordinated organizational and technological activities and a coherent approach on the part of local and state authority bodies within the framework of a unified state policy.

2.2.2. Unified portal — the "one stop" principle

The "one stop" principle is applied in building a unified information system for citizens and organizations being served by public administration. This unified system is part of the complex system for provision of administrative services (by using multi-functional centers in the Internet space). The unified system, constructed to provide administrative services, has to ensure a working mechanism for informing and organizing information service stations for citizens and organizations. The service stations for providing administrative services have to guarantee remote access to information on the results of the executed services to citizens and organizations.

Access to administrative services information is organized (within the general system of provision of administrative services) on the basis of a unified portal for administrative services (info-stand/telephone/mobile technology). The unified system provides processing of citizens' and organizations' queries and requests, search and defining the corresponding administrative body to provide the service result or detailed information about the service. The system provides information to the applicant in real time mode with the help of information and communication devices.

The unified system informing citizens and organizations about the work of tadministrative bodies must be integrated with the internal systems that serve the state government bodies. Along with it, the system also serves the multifunctional centres for providing administrative services, as well as the register of administrative services. Such a constructive organization, built on the "one stop" principle, allows for the setting in motion of different channels for informing citizens and organizations, no matter where the administrative service is requested (from a state authority or from a multifunctional centre).

The unified system following the "one stop" principle functions on the basis of the following elements:

1. Channels for information:
   a) a portal for administrative services;
   b) national and regional centers for telephone service;
   c) information kiosks (informats);
   d) tools for mobile information.
2. Information-providing elements:
   a) a register of administrative services;
   b) for the bodies of authority;
   c) information system of multifunctional centers.

On fig. 2.1 is presented a model of a system for serving citizens and organizations, based on the register of administrative services. The register contains comprehensive information about all administrative services provided by the organs of state authority.

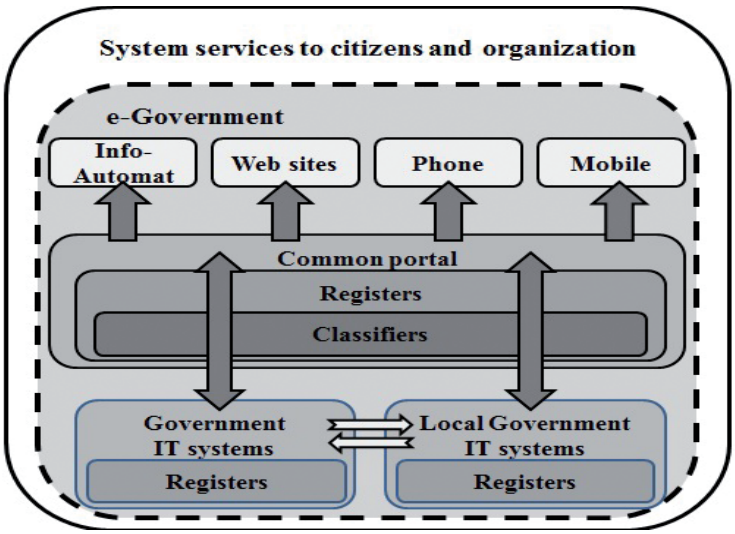

Fig. 2.1. A unified system for serving citizens and organizations

One of the most important components of the register of administrative services is the classification system. Through this system information is classified according a specification (passport) of the state and municipal services. The specification is a standardized form that contains complete information on administrative services: general information, the order to obtain information, appeals, as well as reference to the normative and legal regulation of services. The search of information from the specification of administrative services is carried out by means of service classifier. The classifier is applied in order to systematize services into sections and groups, and in itself it is an orderly informational array of services by the corresponding attributes (for example by social status, by types of directions, by the degree of national importance and other).

For the correct function of the unified system the respective tools are needed, which directly participate in the process of providing public services to citizens and organizations. Together with the tools, corresponding mechanisms are necessary to ensure the functioning of a particular tool within the unified system. The unified system for electronic service of citizens and organizations provides access to information about the work of the bodies of authority by means of various technological solutions on the "one stop" principle: a unified portal for public services, a call center, information stands, devices for mobile service.

Irrespective of the many possible means of service, the basis channel is *the unified portal for public services.* The portal provides information interaction with other tools and mostly with the information systems of the organs of state authority and the multi-functional centers. Now practically every ministry, sector and agency has its own information portal, on which they partially display general and reference information about the services they provide. The available information makes it impossible, or at least highly inefficient, to search and provide methodology, terms and conditions for citizens and organizations to get public services. Therefore, it is necessary to provide the following functional abilities for the unified portal for public services:

1) publishing detailed information about the mode for receiving public services — including the regulations for their provision, the category of the recipient, entitled to this service, argumentation for rejection, requirements about the set of documents, samples and electronic forms of documents;

2) publishing personalized information about the course of services that are being provided, or consultation through the organs of state authority or a multi-functional center, whereby the rights to access to information are differentiated and a personal user account is organized.

Requirements regarding the user interface of the unified portal for public services:

1) it should include general information on national and municipal services with taking into consideration the normative acts/enactments that provision of services to the public is based on, description of the mode of service provision and the categories of services provided, information on the bodies of authority that provide the services;

2) detailed information on the order of getting national and municipal services from the bodies of state authority and the multifunctional centers.

The essence of a unified portal is to enable the user to quickly and conveniently find information about the services provided. Therefore, the unified portal for public services should provide the facilities for integration of the authorities' information systems. In the process of integration, systems participating in the provided service can be activated by a multifunctional center (built according to the "one stop" principle), regardless of the place of residence, region or state where the requester is located. Owing to integration, the unified portal exchanges information with the administrative systems providing public services, and along with that, the portal ensures functional control and monitoring in the course of service provision. In the end the portal provides the necessary reporting data about the service provided.

On fig. 2.2 there is presented a scheme of servicing through a unified portal for public services.

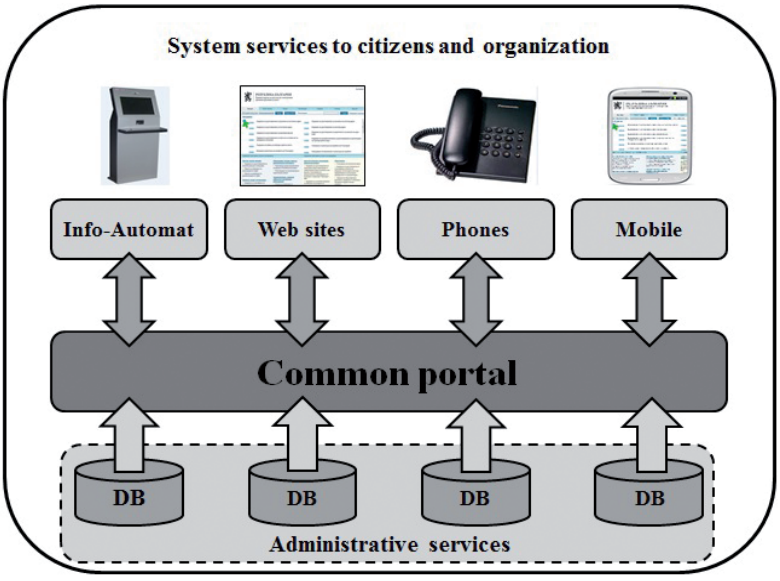

Fig. 2.2. A system for providing public services

Another component of the unified system for providing public services is the Call Center. This center provides reception and processing of incoming telephone requests by citizens and organizations. The call center provides general reference information on the possible state and municipal services. Requests are received in the center over a single national telephone number in cases when citizens refer to the national bodies of executive power.

If necessary, the same request (by means of its single registration number) is sent to the regional service division. The Call Center has to provide:

1) reception and processing of telephone requests by citizens and organizations on question referring to the public services provided;

2) general information on public services to citizens and organizations;

3) reference information on the time and place where citizens can be received in person — the person in charge of citizens relations is a specialist in the conditions and mode of providing public services;

4) switching over to another department call center, should the call refer to its sphere of competences;

5) informing the applicant of his/her rights and of the order of filing a complaint against an officer's action or inaction;

6) information for the applicant/requester on the service status and results.

To ensure the organizational and functional efficiency of the call center, unified requirements must be developed. In these requirements there have to be defined the necessary conditions for providing information via the telephone, the order of interaction with citizens, as well as the technological parameters for the functioning of the said center. From the execution of the operators' function (by the call center) concerning information and reference support one achieves shorter response time for the applicant, higher degree of credibility and the up-to-date character of information, the operator's access to the necessary informationand reference resources, all through the unified portal for public services and following the "one stop"principle.

Regardless of the call center and the unified portal for public services, the unified system for electronic service has to have a channel of information in the form of *information stand* (infomat, kiosk, counter). Sensor kiosks perform the role of "*an electronic helper"* of the human. They can be applied in various fields, including for payment transactions. The simplest and most frequently performed task for the sensor kiosks, however, is providing information. In their quality of being an information terminal, sensor kiosks are used in libraries, museums, exhibitions, railway stations, airports and other public spaces. Sensor kiosks make information available to a wide range of users. A large num-

ber of interactive sensor kiosks combine several types of functions. Apart from the information provided, they enable the user to avail him/herself of various services (service stations). Installed in the sectors of executive power, information stands provide reference information, information on the department activity, working behaviour and visitor reception, as well as various interactive services (payments, opening/closing batch accounts, updating a status and other).

Service via mobile devices (technologies) is a promising and progressively developing means of electronic service of citizens and organizations, of the work of public administration organs and other. At present, however, the said instruments are very poorly presented in the public sector of Bulgaria. This is a consequence of a number of legislative issues and problems in information provision (lack of normative regulations for electronic identification of citizens, no mobile service schemes and other). Mobile service devices allow for receiving information on the course of service provision process. Via mobile telecommunication messages are sent about ongoing stages, decisions and results of service provision.

In the end, the corresponding requirements are formed for the unified electronic system for servicing citizens and organizations. Information contained in the system should cover:

- general information on services provided by the state authority bodies;
- information on the service provision mode;
- information on the legal coverage of the service provision process;
- information on the appeal process against the action (inaction) of state authority employees engaged in service provision;
- information on the process of informing and consulting citizens and organizations on matters concerning the services provided.

Requirements towards the system functionalities:

1. The system should be integrated with the internal systems of state authority bodies and those of the multifunctional centers.

2. The system should be integrated via the unified portal for public services, based on the public service register.

3. The system should be nationally and regionally scalable.

4. The system should be used not only in the places where services are provided by the organs of state authority and the multi-functional centers, but also in centres where a large number of people are centred, interested in getting information regarding authorities (airports, bus stations, railway stations, etc.).

As a technological platform the unified system for electronic service of citizens and organizations by the pblic administration, the system should be

based on a single portal technology. By providing access to information about public services, the system provides interrelation for all channels of the state authority system and those of the local government.

Self-study questions

1. What would be a very specific characteristic of an institutional site compared to other sites?
2. What are the main components of the institutional site?
3. What is the purpose of institutional site?
4. How to raise the professional level of specialists from local and state government in the area of information technology?
5. What are the advantages of a single e-government portal?
6. What integration processes are observed in the single electronic control system?
7. What are the elements that provide the "one stop" principle?
8. What is the content side of the register of administrative services?
9. What is provided through a single portal for public services?
10. What are the functionalities of a single portal for public services?

2.3. E-document management

For studying of part 2.3 it is recommended to use the sources below [76].

2.3.1. Structure and elements of an e-Document

In today's society, where information and communication technologies prevail, electroning documents are gaining importance. Electronic documents are designed to considerably ease work with documents: there is no paper bureaucracy, search of documents is considerably simplified due to the use of electronic databases. In addition, an electronic document has a number of advantages compared to the paper one. For instance, an environmental advantage is the possibility to make changes in the text of the docu-

[76] Kiskinov V. Electronic government / V. Kiskinov. SIBI. Sofia, 2003.

Law on Electronic Document and Electronic Signature: effective from 06.10.2001. Is. 34.

Maneva N. Software technology / N. Maneva, A. Eskenasi. Anubis, 2001.

lex.bg [Electronic resource]. URL: http://lex.bg/laws/ldoc/2135180800 (date of access: 01.08.2016).

MacDonald M. Pro ASP. NET 4 in C# 2010. Microsoft ASP. NET 4 with examples on C# 2010 for professionals / M. MacDonald, A. Freeman, M. Szpuszta. Moscow : LLC "I. D. Williams", 2011.

ment without wasting paper. In the past work with paper documents took a lot of time and labour costs because of the need for hand typing the whole document even if the most insignificant changes had been made.

Under the Electronic Document and Electronic Signature Act (State Gazette issue 34 of 6 April 2001) the electronic document is documented information presented in an electronic form, i. e. in a form that is convenient to be perceived by a human using information and communication technology, as well as for this document transmission in a network environment or processing and storage by information systems.

An electronic document can be defined as a form for preparation, sending, receiving and storing information with the help of coputer devices and the corresponding storage medium. This is information that is objectified in the form of a number of symbols, known in computer technologies as basic elements (*bits* and *bytes*) for processing, storage and transmitting information. Information in the electronic document contains attributes for identification and can be converted into a form that is convenient for human perception.

Some of the tyFigal characteristics of electronic documents are the following:

- it is impossible for a human to directly perceive the electronic document in the physical form it is fixed on the technical carrying device;
- the electronic document is related to the technologies that generated it and is used by means of the corresponding hardware and software, standard and for of data presentation, etc. The technologies involved in creating the electronic document evolve and improve at an exceptionally high speed. There are huge problems when obsolete data have to be read lacking the relevant equipment or software;
- electronic docuents have their own physical and logical structure. Unlike paper documents, where form and content are visualized, the individual elements of an electronic document are stored in a database and only after a processing query can data assume their traditional appearance;
- unlike the paper document, the electronic one is not closely tied up to the information carrier. Information can be easily altered and even destroyed without a trace remaining on the carrier. Certain documents are only realized in the RAM computer memory;
- electronic documents are distinguished by the possibility for unlimited reproduction of the original. This, however, in some cases evokes controversy about verifying the authenticity and legal force of the electronic document;

- the electronic document needs to be protected agains unauthorized access;
- there are still specific rules for confirmation and maintenance/support of the electronic document, such as creating accompanying documentation.

Both paper and electronic documents have advantages and disadvantages, that can be summarised in the following aspects:

1. Time for transferring the document — undoubtedly, electronic documents have an undeniable advantage in this aspect, as electronic communication channels allow transmitting messages for an incredibly short time;

2. Reference and information work (searching information in the information pool by document content and attribute) — with lack of information and optimal scheme of document classification, for paper documents this procedure may be too labour consuming. With electronic documents minimal time is spent, due to address links that allow the locating of not only a certain document, but also other thematically or functionally connected documents.

3. Requirements for document layout — paper docuents have a unified form and meet certain standards. Sometimes certain changes in layout are possible, provided they do not affect certain statutory requisites, particularly those determining the legal force of the document. So far, the layout of electronic documents has not been standardized. Yet reuirements concerning their layout can be more serious than those of the paper ones. For instance, during the transferring of information along the communication channels of different computer systems (for example, mobile ones) and different software. Transferring may be prevented or information may not be accessible to human perception.

4. Legal confirmation of the document — for paper documents practically all problems with their legal force have been solved. For electronic documents of particular importance is the Electronic Document and Electronic Signature Act, which provides the legal conditions for using the electronic digital signature like for instance:

a) duration of the certificate of the key referring to the electronic signature;
b) electronic signature confirms document authenticity;
c) using electronic signature in activities of legal significance.

When the defined conditions are observed, the electronic signature is equivalent to a handwritten signature on a paper-based document. For cor-

rect implementation of the law, specialized certifying centers are created for issuing certficates (keys) for electronic digital signatures.

5. Convenient perception of information — this quality is more apparent in paper documents. Regarding information perception electronic documents can be compared to long medieval scrolls — going over the file sometimes makes one's eyesight blur. Text on a computer screen (monitor) is perceived slower (by 25 %) than when the same text was read on a sheet of paper.

Worldwide a major part of information resource is concentrated in documentation. In the present stage prerequisites are already achieved for conversion to new methods of working with documents — systems for electronic document turnover. Regardless of the problems (legislation, verification, long-term document storage, implementation) the electronic document has a number of advantages over the traditional ones (increased productivity of administration, instant access to information, quick location of the document and many other). Nevertheless, the present stage of our development belongs to complex systems using both paper and electronic source documents.

2.3.2. Electronic digital signature

The European Union created Directive № 93 in 1999, whose purpose is the legal recognition of the electronic signature. Similar laws are in force in Germany, Italy, India, some states in the USA and other countries. Analysis of national and international legislation testifies of the availability of various approaches to regulation of usage of electronic signatures. Differences are identified mainly in using electronic signatures (for instance in public administration, banking transactions, between organizations and other).

As a term in the Electronic Document and Electronic Signature Act, electronic signature (electronic key) is defined asinformation in electronic form, that is added to other information in electronic form (signed information) or otherwise connected to such information, which is used by certain persons, signing the information. The electronic signature is information that connects two objects (subjects): the signed document and the person signing it. The certificate for the electronic key for verification of the electronic signature is issued by an accredited center or a fiduciary of such a center, which have been authorized to issue and control electronic digital signatures.

According to informatization of the electronic business, a pressing issue is that of the legislative rights that will considerably expand the field of application of electronic signature and enable a legally meaningful electronic document flow. In relation to this and many other circumstances, an amendment

was made in the Electronic Document and Electronic Signature Act, which came into force on 1 July, 2011.

The electronic signature as a requisite of the electronic document is designed to protect a certain document from corrections (forgeries), by means of cryptographic conversion of information by using a qualified electronic signature, which allows for the identification of the signature's owner and establishing complete lack of inaccuracies (distortion) of the information in the electronic document.

Asymmetric cartography is used for signing electronic information. The algorithm of asymmetric cryptography enable s the encryption of information, using two keys one for encrypting the message and the other — for decryption. The most protected kind of electronic signature is believed to be the new qualified electronic signature that was introduced under the new law of 1 July 2012. In order to clarify the need for a new electronic signature and what has been changed with ithe law's amendment, a brief historical review is necessary in relation to cryptography, i. e. the program designed to encrypt and assign electronic message. Initially national special services were very sceptical about the possibility for software crypting. Software crypting creates a number of annoying inconveniences for special services, because it is created by independent developers, and, moreover, because it is impossible to decode the message without knowing the key. This means serious difficulties for the special services when they want to read what users communicate about.

Troubles with cryptography started as soon as it appeared. In the early 1990s, programmer Philip Zimmermann created the program PGP (Pretty Good Privacy), which is still the most widely used in the field. The program allows to sign files and messages and also to encrypt them. For signatures and encryptions two keys are used private and public. Usres freely exchange the public key but the private one remains a secret. Message encryption uses a combination of the addressee's public key and the private key of the letter writer. The opposite is necessary for decryption — a private key for the addressee and a public one for the letter writer. By means of such a scheme encrypted messages are exchanged, without any danger of intercepting the decryption key, as long as two keys are used (at least one of them must be guarded). This security of public key encryption (asymmetric encryption) is widely popular on the Internet.

Very soon after he created PGP a criminal investigation started against Zzimmermann for breaking the ban on export of US encryption software. But the law suit was cancelled only three years later. All charges against Zimmermann were dropped. Soon after that Philip Zimmermann set up his

company PGP, where he went on developing the program. The ban on-exporting the program was easily overlooked. Only an electronic copy of the program in its Source kind is made available. Afterwardse the overseas version of PGP, which was brought out of the USA as print out, was compiled form a scanned copy of the text. These are, of course, exotic details, but the fact is other governments also treat cryptographic software very severely in a legal aspect. A number of countries simply forbid the use of any cryptographic tools if these are not certified by a state authority. Besides the ban encompasses not only state-owned organizations which develop or import such programs but everybody! On the other hand, however, no criminal liability is envisaged for breaking the ban and, consequently, many people break it. Hence the proliferation of encryption technology. This applies even to programs delivered with the Windows family of operating systems, as well as to PGP itself, which has practically become a standard in the field.

That is why in the end of 2001 the first Electronic Document and Electronic Signature Act were passed. In its early period the law applied only to legal relationships occurring when civil law transactions are performed. In accordance with this law, the instruments for creating a complete digital signature must have a certificate. All the remaining cryptographic programs immediately assume an incomprehensible status. From a theoretical point, it is possible to sign documents with them, the law does not forbid that. But the legal status of such documents is not regulated. Therefore, for issuing electronic keys the law envisages the creation of a network of digital certification centres which should certify keys upon request by users.

As it was mentioned before, a signature based on asymmetric encryption demands two keys — a public one, which the holder can freely exchange, and a private key which must be kept secret. The private key should not be known to any one, but under the law this key is generated by a certification center, i. e. by total strangers. The law requires from these centres to ardently protect the secret of the key, but, on the other hand, common sense suggests this key should not be trusted to anyone (a case!).

Under the new law electronic keys are qualified, match the private key and also issued by certified service provider. The order of issuing these keys is consistent with the previous rules — the provider also issues electronic signatures for the client by using a certified program — provider's own state certification and renders the signature "qualified". The keys issued while the old law was in force, can be used in a futher period. Under the new law these keys they have the validity of a qualified signature.

Under the new law certification centres issue an electronic signature certificate, which enables the creation of a private (qualified) key and a public key for verification of the applicant's electronic signature. Oviously, under the new conditions the certification centre only issues the certificate and the electronic key is generated by the user him/herself, in case of need. So, it is no longer necessary for the user to trust the certified service provider. Under the new law electronic signature can already be used not only by individuals, but organizations, legal entities and state authorites also can possess one.

The electronic government suggests the creation of a nationwide distributed system of public administration, which implements decisions about the entire spectre of tasks related to document management and the processes of their ciphering. Thus work under the conditions of the electronic government is wholly based on the electronic signature. If that is missing, full authorization is impossible. In addition, it is with the help of electronic signature that the document verification takes place. In a certain aspect, the government makes it compulsory for legal entities to prepare reports electronically, to make purchases, implement document turnover systems in their internal work. What is more, the government calls for interdepartmental electronic interaction. On the other hand, the government provides services to citizens and businesses electronically and in these processes the electronic signature is already necessary. So the prospects are relatively wide for the use of electronic signature.

By adopting the concept of electronic government in the Republic of Bulgaria in March 2010 there is envisaged a gradual restructuring of all systems of interdepartment electronic interaction. It should unite the efforts of public administration in Bulgaria and convert administrative services into a single nationwide electronic forma by means of the Internet. Unification begins of heterogeneous department information systems into a unified portal (www.egov.bg). For example, the system of the National Revenue Agency and that of the National Insurance Institute have united as structures, as well. The important thing is that at present citizens and representatives of organization do not seek service result from office to office, they now address a unified portal of the national or local government. In its present state the system, via the portal www.egov.bg allows for the realization of the "one stop" principle.

The electronic digital signature may be applied by legal entity and individuals for submitting income tax returns electronically, receiving the necessary references, submitting reports to NRA and NII, replies to questions from state authorities and organizations, participation in competitions at national

or local level, regardless of where these competitions are held and where the participant lives. The electronic signature is also applied for identification in systems of authorized access to banking institutions. It is used in some information systems for electronic notary services in corporate deals.

Applying an electronic digital signature is a real technology, accessible and necessary to a considerable number of people. An understanding seems to be formed that using electronic signature may substantially alleviate the exchange and storage of documents. Already an electronic signature can be applied in all spheres of B2B, G2B, as well as in G2C processes. This in turn actively facilitates the development of the electronic government services and its "front office" — a portal for automated services (without the participation of an administrative officer).

Several project feature in the agenda of the electronic government, such as a citizen a single ID card (Estonia, Colombia and other) which inites bank cards with electronic signature. Initially, the availability of individual PIN cards was strategically important, but at present it can begin creating only inconvenience. For this reason, in Bulgaria already serious opportunities are sought for the electronic signature to be universally applied, which for years has been a routine in other countries.

Self-study questions

1. Name the advantages of an e-document.
2. What is the structure of an e-document?
3. What are the specifics of an e-document?
1. What are the required conditions for the transition to electronic document systems?
2. What is the electronic signature certificate for?
3. Why is the principle of asymmetric cryptography used for signing electronic data?
4. Why are two keys used for signing an electronic document?
5. Which elements of the electronic signature are issued by certification services authorities?
6. Who is allowed to use contemporary electronic digital signing?
7. What is the role of the single ID card?

3. DEVELOPMENT OF WEB APPLICATIONS FOR E-BUSINESS

For studying of part 3 it is recommended to use the sources below [77].

3.1. First look at ASP. Net technology (ViewState and hidden fields)

3.1.1. Part 1

1. Open Visual Studio and create a new project (Menu → File → Create → Project).

2. In the left part of the window choose the Web Template. In the middle portion, select the item "ASP. Net Empty Web Application".

3. In the lower part of the window set a name for the project and press OK (fig. 3.1).

[77] Northrup T. Web Applications Development with Microsoft.NET Framework 4 / T. Northrup, M. Snell. Microsoft Press, 2010.

Darie C. Beginning ASP. NET E-Commerce in C#: From Novice to Professional / C. Darie, K. Watson. Apress, 2009.

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Academic studies press [Electronic resource]. URL: http://www.bibliorossica.com/book.html?&currBookId=12168 (date of access: 01.08.2016).

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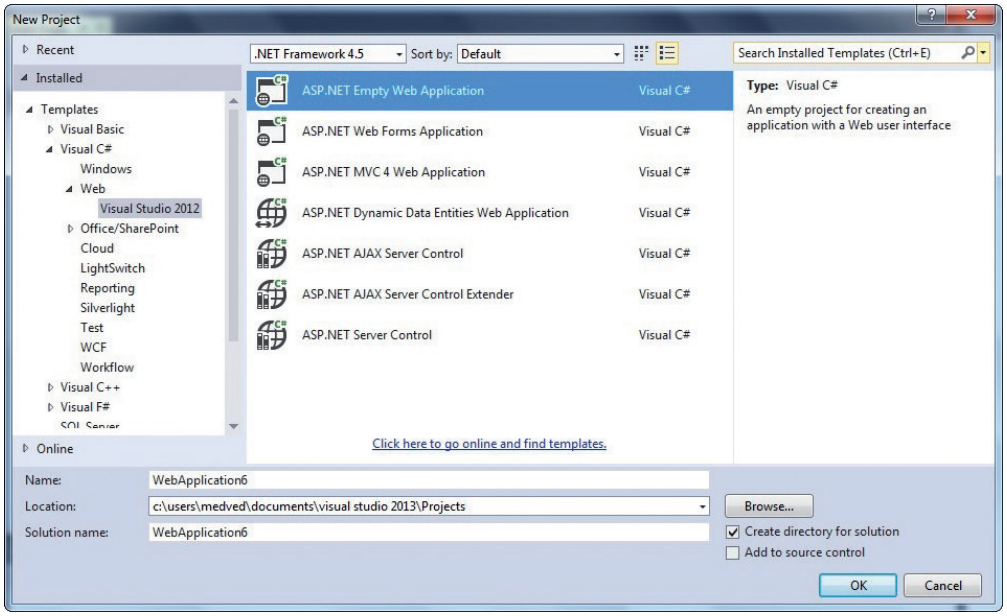

Fig. 3.1. Create project

4. Create the first page of the project. For this purpose, right-click on the name of the project (WebApplication1). Then select the item "Add-New Element".

5. From the dialog box, select "HTML page" item and click on the Add button.

6. By default, there will be some HTML code in the new document. It represents structure of any HTML page. The HTML page has the following structure:

```
<! DOCTYPE HTML PUBLIC "-//W3C//DTD XHTML 1.0 Transitional//EN" "http://www.w3.org/TR/xHTML1/DTD/xHTML1-transitional.dtd">
<HTML xmlns="http://www.w3.org/1999/xHTML">
<head>
    <title></title>
</head>
    <body>
    </body>
</HTML>
```

The DOCTYPE tag is used for the HTML document (document type definition) instruction. Types of documents differ depending on the HTML version which is used in the document.

The <HTML> tag defines the beginning of the document. There are two sections in it: <head> (document heading) and <body> (document body).

The section <head> contains the <title> tag which defines web page heading. Also this section can contain references to files which affect the appearance of the page (CSS files), links to scripts, and also <meta> tags (keywords, the description).

7. Add page heading:

```
<title>Main page</title>
```

8. Add one paragraph of the text in the body of the page (<body> tag):

```
<p>Some text is here</p>
```

9. Copy the first paragraph and insert it two-three times below under the first paragraph.

10. Run the project (Ctrl + F5), or switch in design mode of the page (in the lower part of the current window there is Design tab).

Look at page in browser. The heading specified in the <title> tag will be displayed in the name of the tab. Pay attention to displaying of paragraphs.

11. Add header of the first level <h1></h1> before the first paragraph (there are six levels in HTML [from h1 to h6]):

```
<h1>Heading of the first level</h1>
```

12. See changes in Design mode of the page.

Furthermore, we will consider the main tags for formatting of the text. In Table 3.1 the most often used tags are listed.

Table 3.1

The most often used HTML tags for formatting text

Key HTML	Description
Text	Bold text
Text	Italic text
<u> Text </u>	Underlined text
^{Text}	Superscript
_{Text}	Subscript
<strike> Text </strike>	Strikeout text

Table 3.1

Key HTML	Description
<pre> Text </pre>	Defines the block of previously formatted font. Use, for example, for an arrangement any computer code on the page
Text	Italic text
Text	Bold text
	For the text in this tag it is possible to adjust such attributes, as: color, size, name of a font, etc.
 </br>	New line

13. Add the following code to a page marking:

```
<h3>Formatting of the text</h3>
<b>Bold text</b><br/>
<i>Italic text</i><br/>
<u>Underlined text</u><br/>
H<sub>2</sub>SO<sub>4</sub><br/>
Metr<sup>2</sup><br/>
<strike>Strikeout text</strike><br/>
<pre> All spaces remain unchanged</pre><br/>
<em>Italic text</em><br/>
<strong>Bold text</strong><br/>
<font color="red" size="4" face="Arial">Red text, size 4,
Arial font</font><br/>
```

14. Switch in Design mode. Look at changes on the page.

15. Add three paragraphs with various alignment of the text: on the right edge, on the left edge and centered.

```
<p align="left">Text is aligned to the left</p>
<p align="right">Text is aligned to the right</p>
<p align="center">The text is aligned to the center</p>
```

16. Switch in Design mode. Look at changes on the page.

17. Try to type the text with the formatting, which is specified below:

HTML (*HyperText Markup Language*) — **standard markup language of d o c u m e n t s** in **World wide web**. The majority of web-pages *contain the description of a marking* in the **HTML** language (or XHTML). The HTML language is interpreted by ~~browsers~~ and displayed in **the form of** $_{\text{document}}$ **in a convenient for person form**.

3.1.2. Part 2

1. Open Visual Studio and create new project (menu File → Create → Project).
2. In the left part of the window "New Project» select template "Web". In the middle column select item "ASP. Net Empty web application".
3. At the lower part of the window, set the project name and click button "OK" (fig. 3.2 and fig. 3.3).

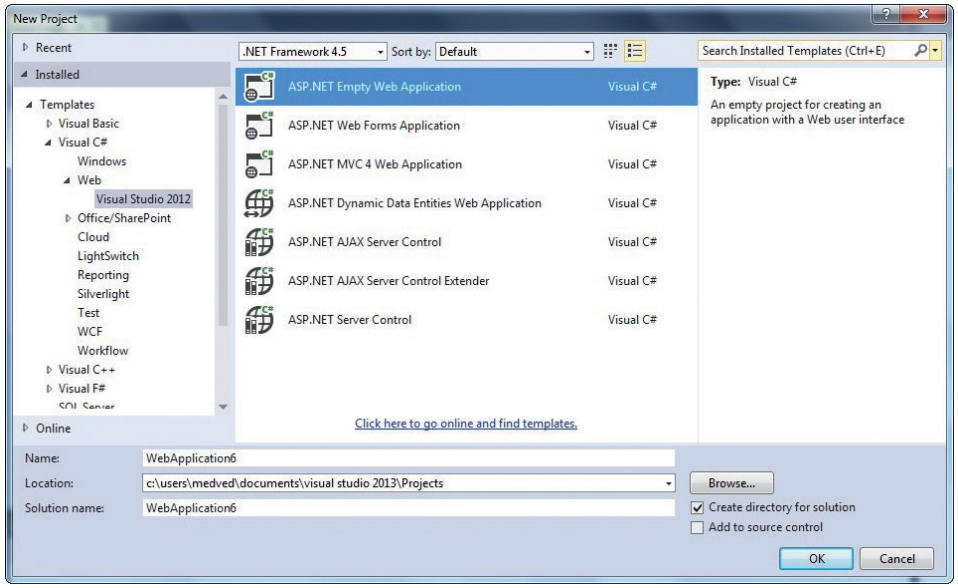

Fig. 3.2. Window of creating project

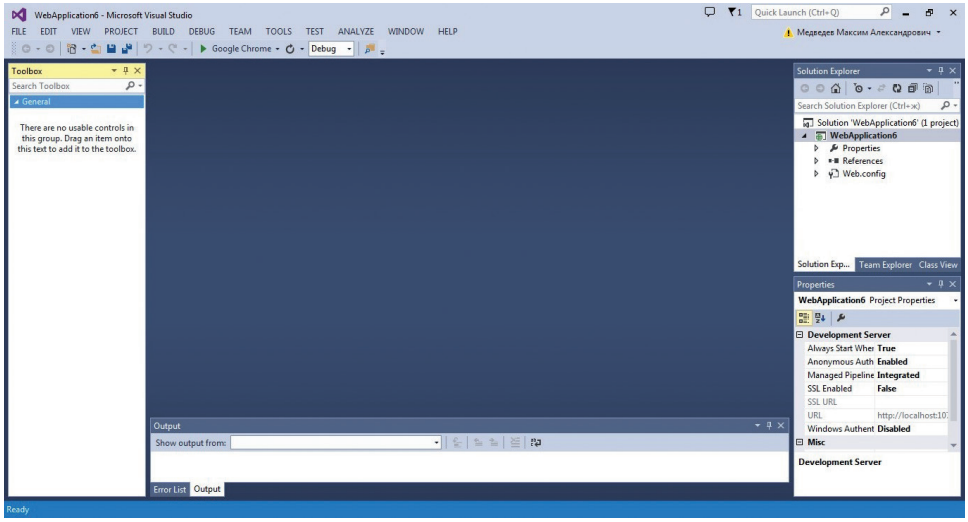

Fig. 3.3. Created project

4. In order to create first page of project, click the right mouse button on the name of project. Choose items “Add — New Item”.

5. In the appeared window, choose item “Web Form” and click button “Add” (fig 3.4).

6. Created form already contains HTML code (fig. 3.5).

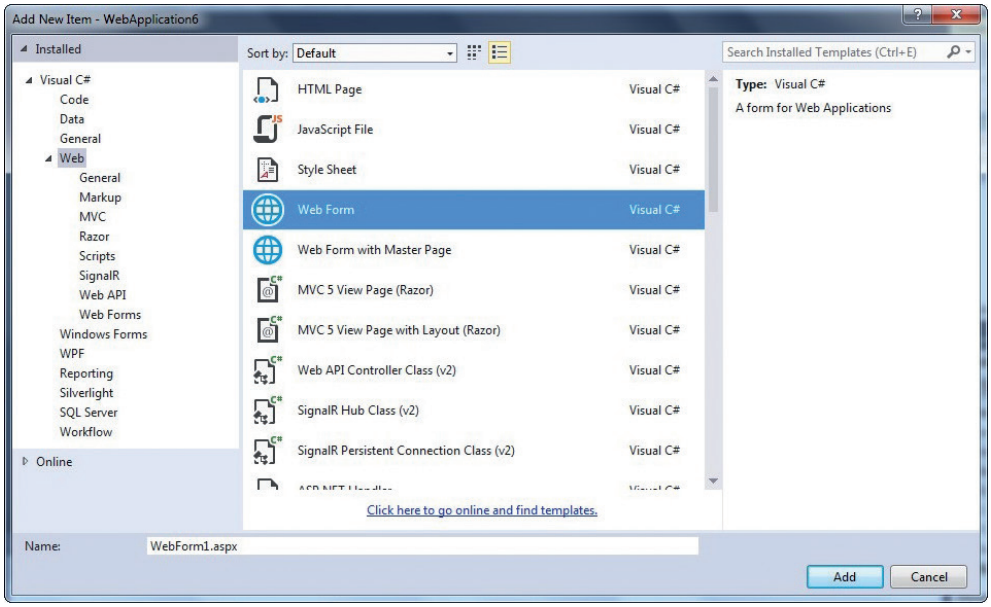

Fig. 3.4. Adding new element

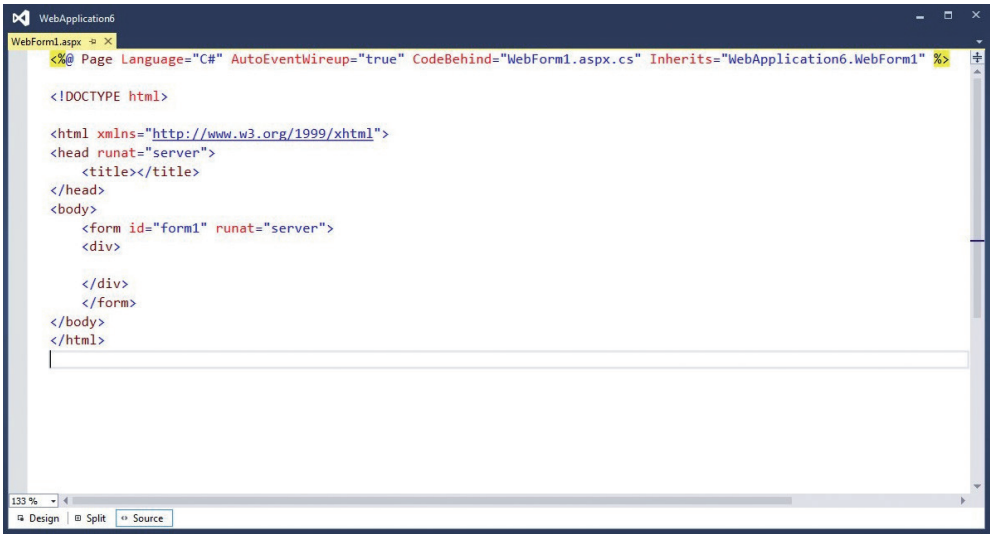

Fig. 3.5. WebForm1

The first line tells us that the page is part of an ASP. Net application. Directive "Page" contains specifying on programming language used in code-behind file, the name of the code-behind file and some regarding inheritance. Standard elements of HTML code are below. But there are some differences from standard elements. Some elements have option "runat=server". This option shows that each similar element will have the server component that implements some logic to work with this element.

Tag <form> is main tag on the page. This is the server form (it has the option "runat=server").

> The server form must be only one on the page!

7. Add controls to the page. All controls must be placed inside tag <form>. Drag and drop unto the page these controls; a "button» and "dropDownList" from the ToolBox (which is on the left side of main window). Place the controls inside the tag .

8. Switch to design mode. To do this, click on the tab "Design" on the lowest part of the window.

9. Select with mouse the element "button" on the form and press F4. The Properties window of this element will appear. Set the background color (property: BackColor) for button and change the text on it (property: Text).

10. Add to items collection of "dropDownList" two new elements. In order to do this, select the element. The icon of a triangle will appear on the right side of selected element. Click on this icon. The edit form of items collection will be opened. Add two new elements to the collection, and close the form.

11. Run the project (Ctrl + F5). Click on the button and see what happens to the page. On this stage you will see only reloading of the page, because we have not determined logic for this button.

12. Take a look at HTML code of page in web-browser. Control "button" and "dropDownList" with tags <asp> worked on the page as regular HTML elements — "input" and "select". However, the layout of the page contains two new items with property type = "hidden". These so-called Hidden fields store the state of controls on the page. The protocol http does not transmit data about the state of controls of the page. Using Hidden fields, data about the state of controls of the page (ViewState) and information about form events (EventValidation) is sent on server. Server after request handling generates HTML code of the page for client. However, condition of controls don't reset to the initial, but remain in the same state in which it was passed in the hidden fields in the query to server (fig. 3.6).

```
<!DOCTYPE html>

<html xmlns="http://www.w3.org/1999/xhtml">
<head><title>

</title></head>
<body>
    <form method="post" action="WebForm1.aspx" id="form1">
<div class="aspNetHidden">
<input type="hidden" name="__VIEWSTATE" id="__VIEWSTATE"
value="fJkxXkQLmc7PB4IfRqMmPh1oAUgEtvIGQPdEUXP7Gp+WSQmYkL2byT+Nyu7LX/LxEcQTLTNGg73E1VVitvvzITg7JR3jb5qkAy1eco3xtPQ=" />
</div>

    <div>

    </div>

<div class="aspNetHidden">

        <input type="hidden" name="__VIEWSTATEGENERATOR" id="__VIEWSTATEGENERATOR" value="C687F31A" />
</div></form>

<!-- Visual Studio Browser Link -->
<script type="application/json" id="__browserLink_initializationData">
    {"appName":"Chrome","requestId":"e3a59034a1344a719171da73ab1ae19c"}
</script>
<script type="text/javascript" src="http://localhost:10809/15254fb32155444aa3241a0d67a0626e/browserLink" async="async"></script>
<!-- End Browser Link -->

</body>
</html>
```

Fig. 3.6. Page source

13. Add the control “label” below “dropDownList”.

14. Create event handler for button on the page. In order to do it, make double click on the button in Design mode. Visual Studio will automatically generate C# event handler for Click event.

15. Insert some code in “Click” event (fig. 3.7). Code is shown below.

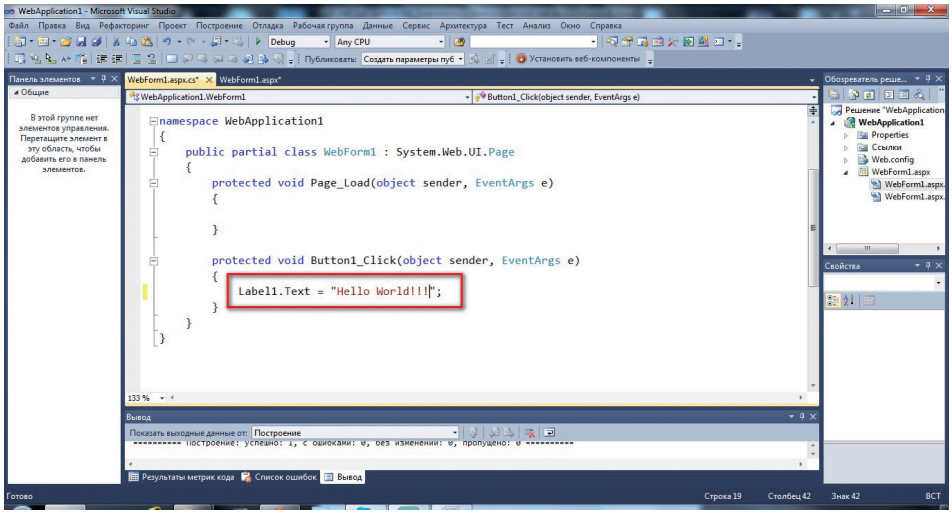

Fig. 3.7. C# code of event handler

16. Run the project (Ctrl + F5) and click button on the page. When pressing the button event handler is triggered. The Text “Hello world!” will appear below the “dropDownList”.

17. Set the property value “autoPostBack” for “dropDownList” equal to “true” (after that, every action with “dropDownList” will cause a request to the server).

18. Create an event handler “dropDownList1_selectedIndexChanged” (event that occurs when changing of value in the list). In order to do this, make double click on “dropDownList”. Visual Studio will open the code-behind the file and generate the code for the event handler.

19. Add within the event handler the following C# code:

```
  protected void DropDownList1_SelectedIndexChanged (ob-
ject sender, EventArgs e)
  {
      Label1.Text = DropDownList1.SelectedValue;
  }
```

20. Run the Project (Ctrl + F5).

21. Open the HTML code of the page in web browser. It is seen, that some JavaScript code appeared in page layout. This code causes the request to the server when changing any item in the “dropDownList”.

22. Add an element “checkBox” on the form. Set the property value “autoPost-Back” equal to “true”. Create an event handler “checkBox1_checkedChanged”.

23. Add within the event handler the following condition: if “checkBox» is selected, then set the “Label1.Text” value equal to “checkBox.Text” value.

24. Run the project. Test all elements on the page.

Self-study questions

1. Give examples of controls in ASP. Net. What events can be processed for controls “button” and “«dropDownList”?
2. What is ViewState and for what it used?
3. Explain the purpose of the property “autoPostBack”. What happens when we set the value of this property to “true”?

3.2. Working with ASP. Net controls. Data entry validation

1. Create an empty ASP. Net application.

2. Add a new page (WebForm.aspx) to the project.

3. Create markup of the form for data entry in HTML code of the page. It will be a table of two columns and three rows. The last (third) column will

have width equal to two columns. In order to create the markup, type between the and tags the following code (as shown in fig. 3.8).

It is known that tables consist of rows and columns. In each cell of the table it is possible to place any content (for example some text or drawings). As a rule, tables are used for structuring some data.

To add the table to the web document, use the <table> tag. To add rows to the table, the <tr> tag is used, and for adding columns the <td> tag is used.

Furthermore, we will consider the main attributes of tables and cells (table 3.2).

Table 3.2

Attributes of tables and cells

Attributes of tables		
Attribute	Value (example)	Discription
Align	Left, Right, Center	Alignment of the table
Background	URL	Background image
BgColor	#0d0d0d	Color of a background
Border	2	Frame thickness, pixels
BorderColor	Black or #000000	Color of a frame
CellPadding	10	Distance between border of a cell and its contents, pixels
CellSpacing	15	Distance between cells, pixels
Width	500 or 75 %	Table width, pixels
Height	200 or 80 %	Table height, pixels
Attributes of cells		
Attribute	Value (example)	Discription
Align	Left, Right, Center	Alignment in cell
BgColor	#0d0d0d	Color of background
BorderColor	Black or #000000	Color of frame
Colspan	2	Combining a predetermined amount of cells vertically
RowSpan	3	Combining a predetermined number of cells horizontally
Valign	Top, Bottom, Baseline, Middle	Alignment in the cell vertically
Width	20 or 15 %	Cell width
Height	15 or 20 %	Cell height

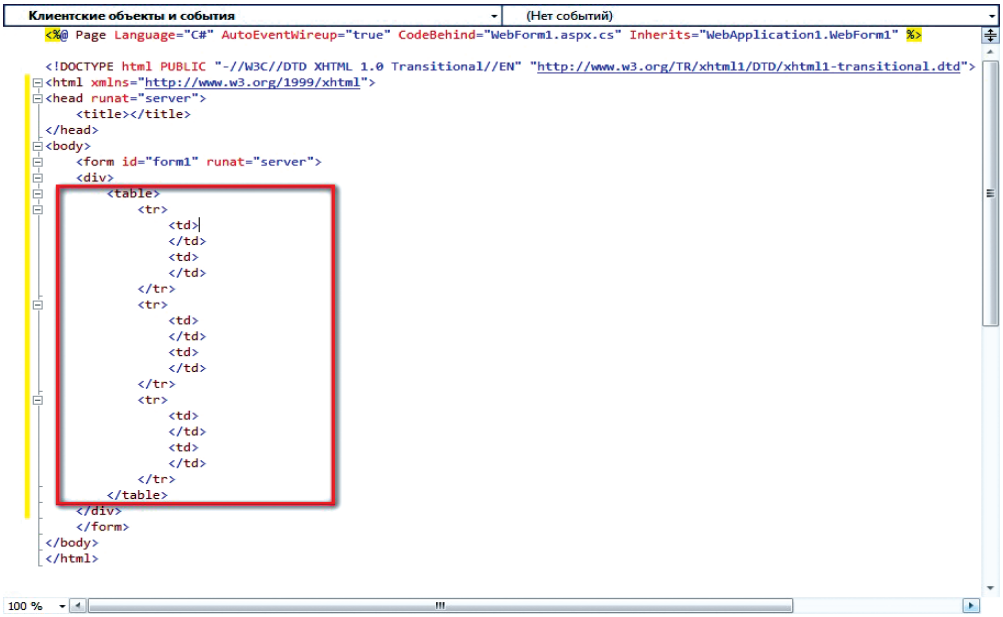

Fig. 3.8. HTML markup of page

4. Add controls to the form: two “Label” elements, two “textBox” elements and one “button” element. Drag and drop these controls unto the page from the “toolbox” (it is located in the left part of the page). After adding all the elements, the code will look like this (fig. 3.9).

5. Add one more “Label” element on the page. Place it under the button.

6. Create the event handler for the button by double clicking the button.

7. Type the code for the event handler which will process the data entered by the user into the fields of this form and will output the result of processing in the text property of “label” located under the button:

```
Label4.Text = TextBox1.Text + " " + TextBox2.Text + " " + TextBox3.Text;
```

8. Run the project and press the “button” to check the output of the event handler.

> Also, it is necessary to check the data entered by the user (whether data was truly entered into fields, format of input of phone and email address). For this purpose, we will place special controls «Input validators» on the form for each field.

9. Switch to “Design mode”. Select the “textBox1” and press once the right arrow on the keyboard. Cursor will be located on the right from a text field.

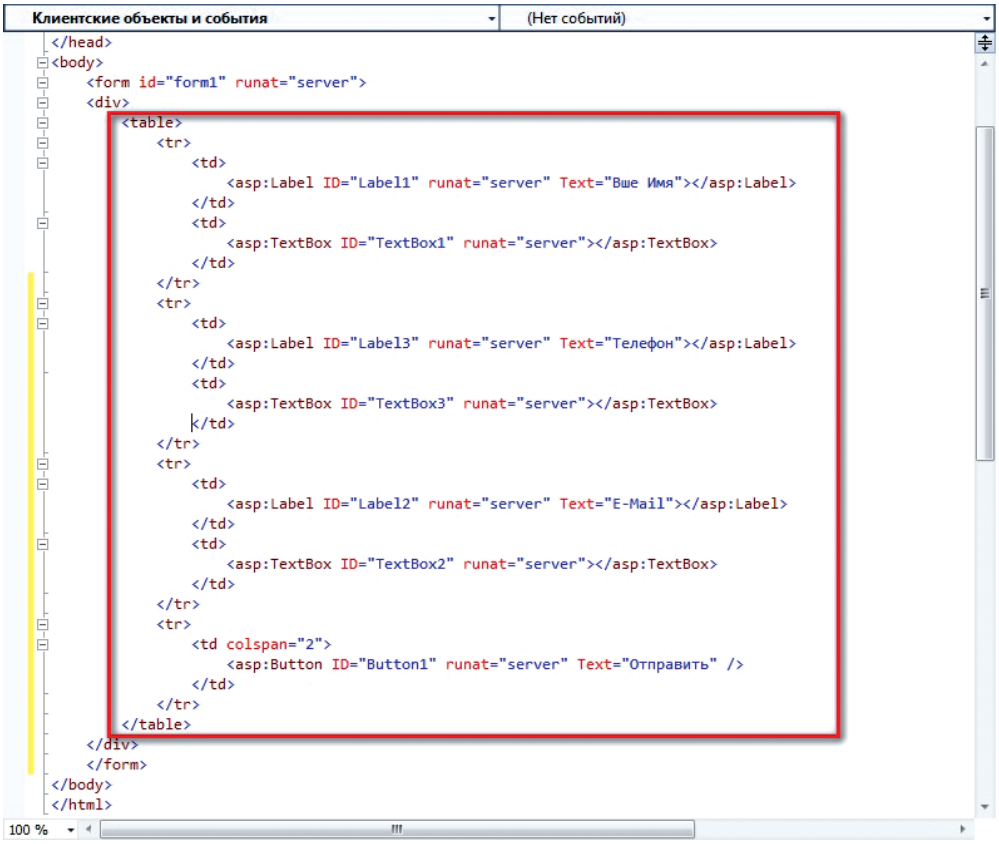

Fig. 3.9. HTML markup of page

10. Open the “Validation” tab in the “Toolbox” (it is located on the left of the window). Click twice on “requiredFieldValidator” element (the cursor will be on the right of a text field).

11. Use the mouse to select the added validator and press F4 for switching to the properties window.

12. For the “controlToValidate” property, choose the text field “textBox1” (“controlToValidate” property sets element which need to be checked for data entry correctness).

13. For “errorMessage” property (this is the message which will be displayed on the page in case of input of incorrect data) enter, for example, a symbol *.

14. Further, repeat steps from 9 to 13 for “textBox2” and “textBox3”.

15. For the field “e-mail”, repeat steps from 9 to 13, and add one more validator — “RegularExprssionValidator”. Place it near with the “Required-

FieldValidator" which have been added earlier. This control allows checking of the format of the e-mail address entered by the user.

16. Open properties window of this validator.

17. Choose the text field "textBox3" for "controlToValidate" property.

18. Enter the following text For "errorMessage" property: "e-mail is not correct".

19. Furthermore, choose "validationExpression" property (this property allows to set a format of data for which it would be desirable to receive from the user in case of data entry) and press an icon with the image "...".

20. Choose standard expression "The e-mail address in the Internet" in the opened window and press "OK".

21. Switch to the Design mode of markup of the page and pay attention how the HTML code has changed, what lines were added in page markup.

> After adding validators unto the page, we can check the form with the user data. But we need to change the code/logic of the page so that data is checked before sending request for the server

For this purpose we will take the following actions:

22. Switch to the file containing the logic «WebForm.aspx.cs».

23. Change the code of the event handler of the button as follows:

```
  if (! Page.IsValid) return;
  Label4.Text = TextBox1.Text + " " + TextBox2.Text + " "
+ TextBox3.Text;
```

24. Run the project.

25. Press the Send button without data entry. The validators placed on the page will run and there will be this symbol * from the right of the text fields.

26. Check operability of the validator regarding the format of email address. For this purpose enter into "textBox3" wrong email address (for example, without specifying of the zone "ru" or "com", or without the sign @).

> During the work of validators on the page (if data is entered wrongly) there will be no request for the server. The infrastructure of ASP. Net creates JavaScript-code for handling the data entered. If all validators reported to the page about a successful completion of validation of the data (checking of property if the Page.IsValid), the form will be sent to the server and will be handled according to the logic (in our case data will be output in a text label under the button).
>
> There is control called "ValidationSummary", to report to the user about all mistakes in a convenient format.

27. Switch to the page markup mode.

28. After the tag add control "ValidationSummary" from the "Validation" tab located in "Toolbox".

29. Start the project. The result of the work of "ValidationSummary" will be visible over the fields of the form (three lines with * symbols). In order for the user to understand what mistakes occurred during input of data, it is necessary to change properties of validators of text fields.

30. Switch to the "Design mode". Select with mouse the RequiredFieldValidator near the first text field.

31. For "errorMessage" property set "Please, enter Name" value.

32. For Text property set " * " value.

33. Make similar steps for validators of other text fields ("RequiredFieldValidator").

34. Change the value of the "Display" property to "dynamic" for all validators ("Display" property sets a method of display of checking of correctness of data entry. The Value of the "dynamic" property says that the control in which the error message is displayed, will be generated in HTML markup only in case of input errors. If the property's value is set to "Static", the markup for this element will be generated in case of project startup, and CSS property of the display element will be set as none).

35. Run the project. Press the button without data entry in the form.

Self-study questions

1. Why use validators on the page?
2. What types of Validators do you know?
3. Which Validator is used for validation of email address input?

3.3. Styling of pages (Master Page technology). Templates, themes, skins

Master Page technology is used for setting the template of the markup of page/pages in the web-applications. According to this technology, all pages have some static controls and, in the same time, there is the place to output dynamic content ("contentPlaceHolders").

Themes in ASP. Net are used for setting some specific set of styles and images for pages.

Skins allow setting of visual properties for some group of controls in an application. For example, after setting the skin for a control "Button", all buttons on the page will have visual properties which were set in this skin.

The <img> tag is used for adding of images to the HTML page. The "src" attribute for this tag is obligatory. It points to the location of the image file.

Also there is an "alt" attribute. If the image for any reasons isn't loaded (or in the browser loading of images is disconnected), on that place where there has to be an image, the alternative text will be displayed, which was specified in value of this attribute.

The address of the image can be both absolute and relative. Examples of such addresses are shown below:

```
<img  src="http://www.mysite/images/img1.jpg" alt="Figture"/> – absolute address of image.
<img src="/images/img1.jpg" alt="Figture"/> – the placement address concerning the site root.
<img src="img1.jpg" alt="Figture"/> – the address of the location relative to the current document.
```

1. Create a new empty ASP. Net project.

2. Add to the project a new element "Master Page" and maintain the name of the page as default "Site1.Master". MasterPages have some differences from common web forms. There is a directive "Master" in the first line of the page. Also, you can see this element "contentPlaceHolder". This is the place on the page which will display dynamic content from the web form application.

3. Add markup on the page above and below "contentPlaceHolder" (for example, as shown in fig. 3.10).

4. Run the project (take a look at the page in the browser).

5. Save and close the markup file of the "Site1.Master".

6. Add to the project the element "WebForm" which uses Master Page and set the name of the page as "WebForm.aspx". Then click the button "OK".

7. In the new page window, select from the right "Site.Master" page which will display content from our web form and press button "OK".

The new page will be created. It will be different from normal Web Forms because it has new attribute "MasterPageFile="~/Site1.Master."" in the first line of the page. The markup of the page consists of only controls "contentPlaceHolder", contents of which will be display on the Master Page (fig. 3.11).

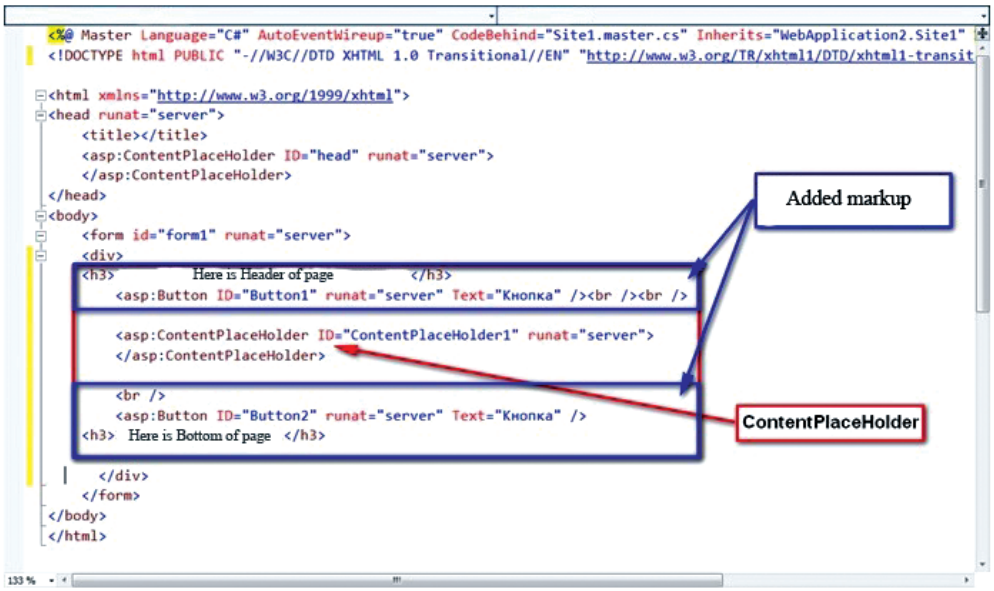

Fig. 3.10. Page markup

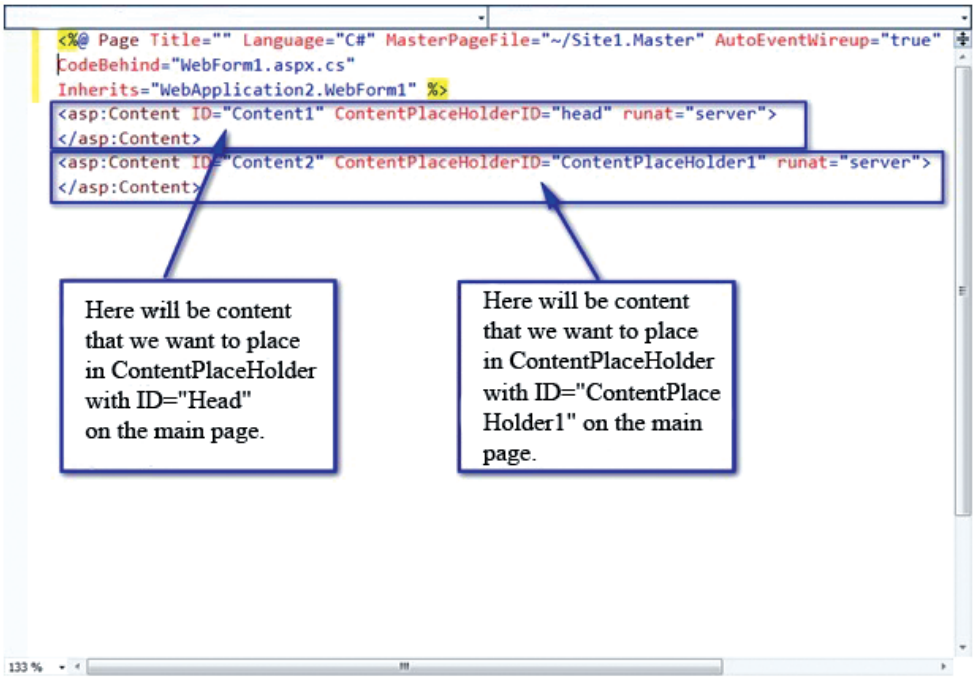

Fig. 3.11. Page markup

8. Then place the simple table (registration form) inside the control "contentPlaceHolder1" (for example, as it is on the fig. 3.12).

```
<%@ Page Title="" Language="C#" MasterPageFile="~/Site1.Master" AutoEventWireup="true"
    CodeBehind="WebForm1.aspx.cs" Inherits="WebApplication2.WebForm1" %>

<asp:Content ID="Content1" ContentPlaceHolderID="head" runat="server"></asp:Content>
<asp:Content ID="Content2" ContentPlaceHolderID="ContentPlaceHolder1" runat="server">
    <table>
        <tr>
            <td><asp:Label ID="Label1" runat="server" Text="Name"></asp:Label></td>
            <td><asp:TextBox ID="TextBox1" runat="server"></asp:TextBox><br /></td>
        </tr>
        <tr>
            <td><asp:Label ID="Label2" runat="server" Text="E-mail"></asp:Label></td>
            <td><asp:TextBox ID="TextBox2" runat="server"></asp:TextBox><br /></td>
        </tr>
        <tr>
            <td><asp:Label ID="Label3" runat="server" Text="Year of birth"    ></asp:Label></td>
            <td>
                <asp:DropDownList ID="DropDownList1" runat="server">
                    <asp:ListItem>1995</asp:ListItem>
                    <asp:ListItem>1996</asp:ListItem>
                    <asp:ListItem>1997</asp:ListItem>
                </asp:DropDownList>
            </td>
        </tr>
    </table>
    <br />
</asp:Content>
```

Fig. 3.12. Page markup

9. Run the project. Take a look at the browser, notice how the page has changed (in which part of the page the content of Web Form was displayed).

10. Right click on the project name and select "Add new folder ASP. Net" in the context menu.

11. Select folder "Theme". The new folder "App_Themes" will appear in the tree of the project. There is already one theme file "Theme1" inside folder "App_Themes".

12. Similarly, create one more theme with name "Theme1".

13. Add to the "Theme2" css-file. Right click on "Theme2". Select the item "Add" → "New Item" in context menu.

14. Select "StyleSheet" in the opened window (leave the name of the file as default "StyleSheet1.css").

15. Type the css-code in the css-file as it's shown on the fig. 3.13.

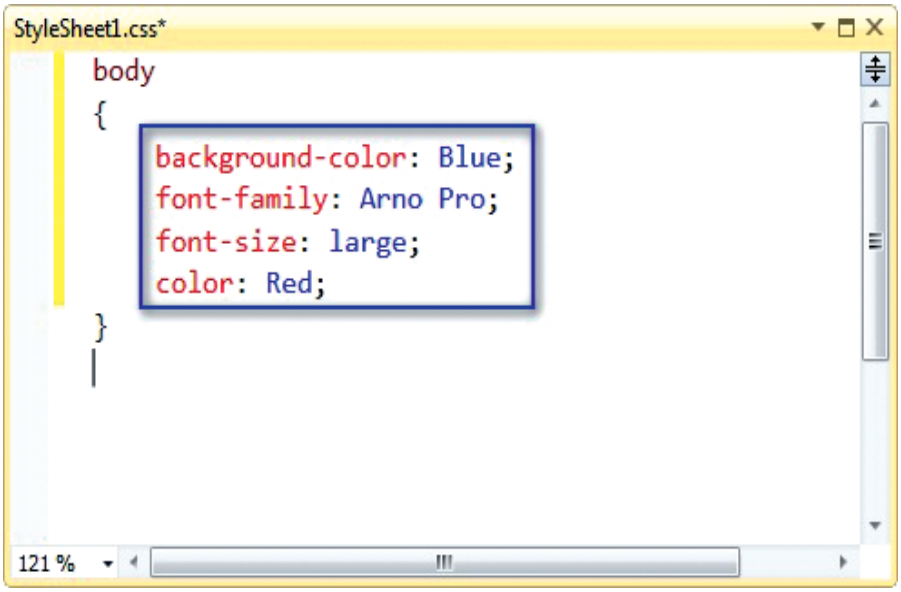

Fig. 3.13. StyleSheet file

16. Similarly, create a css-file for the "Theme2". Change the value of the property "background-color" to "Red", and value of the property "color" — to "Blue".

17. Make the link of "Theme2" on the page. For this purpose, add a new attribute "Theme" with value "Theme1" after directive "Page" in the first line of the page.

18. Run the project.

19. Change the value of the attribute "Theme" on "Theme2" and run the project again. Take a look, what changes have happened on the page.

20. Add in the folder "App_Themes" skin-file. Leave the name of the file as default. Click button "OK".

21. Add code for description of style of all buttons on the page (fig. 3.14).

22. Run the project. In the browser you will see that format of all buttons matches to description in the skin-file. The structure of the ASP. Net has loaded the theme for this page specified in the first line of the markup of the page. Also, there is the skin-file "Skin1" in the same folder. It is automatically loaded with the theme, which was loaded for this page.

23. Create skin-file for the "Theme2". Set the properties for buttons in this file, which should be different from properties in the skin-file for "Theme1".

24. Set the "Theme2" for the page as you have made it for "Theme1" (step № 18).

Fig. 3.14. Skin file

25. Run the project. Take a look, how it worked out with "Theme2" and the "skin-file" for this theme.

Self-study questions

1. What are the Templates and for what they are used?
2. What control on the Master page displays the content of web forms?
3. How can you create a new Theme and set it for the page?
4. How can you set the same format for controls on the page?

3.4. Work with client scripts in ASP. Net. Ajax-extensions

1. Create a new empty ASP. Net application.
2. Add a new page (web form) to the project.
3. Add a Button to the page.

Furthermore, we will try to create "javaScript" code and to tie it to a "Click" event to the created button. There are two ways to do this. First way: to create the JavaScript file, then write the necessary functions in it, then connect this file to the page by means of the "link" tag and to register the "onClick" attribute in your HTML code for the button. Second way: to create JavaScript in the code-behind file of the page in the event handler "PageLoad" and to add this script to the attributes of the button. We will use the second way.

4. Add the control "ScriptManager" into the "form" tag of page (using the "Toolbar" from the Ajax-extensions tab).
5. Switch to the code-behind file (WebForm1.aspx.cs).
6. In event handler "PageLoad" create a simple javaScript which will request confirmation of some action from the user when pressing the button:

```
string script = "return confirm ('Are you sure?');";
```

7. For the next line of code, we will add the created script to attributes of the button:

```
Button1.Attributes.Add ("onclick", script);
```

8. Run the project. Check the functionality of the button. In this case, JavaScript created earlier is started when pressing the button. Thus, if the user presses the Cancel button, the reload of the page and the request on the server doesn't occur.

9. Add a control "textBox" from the right of the button.

10. Then add one more control "textbox" on the next line.

11. Add the following code in the event handler "Button1_Click":

```
TextBox1.Text = DateTime.Now.ToLongTimeString ();
TextBox2.Text = DateTime.Now.ToLongTimeString ();
```

12. Run the project. Press the button. The text fields will display the current time of the server. Further, we will try to add Ajax-functionality on the page (updating of only certain part on the page). We want only the first text field to be updated when pressing the button.

13. Add a new control "updatePanel1" (it is in "Toolbox", Ajax-extensions tab) to the page and "ContentTemplate" element into "UpdatePanel1". The page markup after modification is shown in fig. 3.15. Controls "Button1" and "TextBox1" are in the element "UpdatePanel1" now.

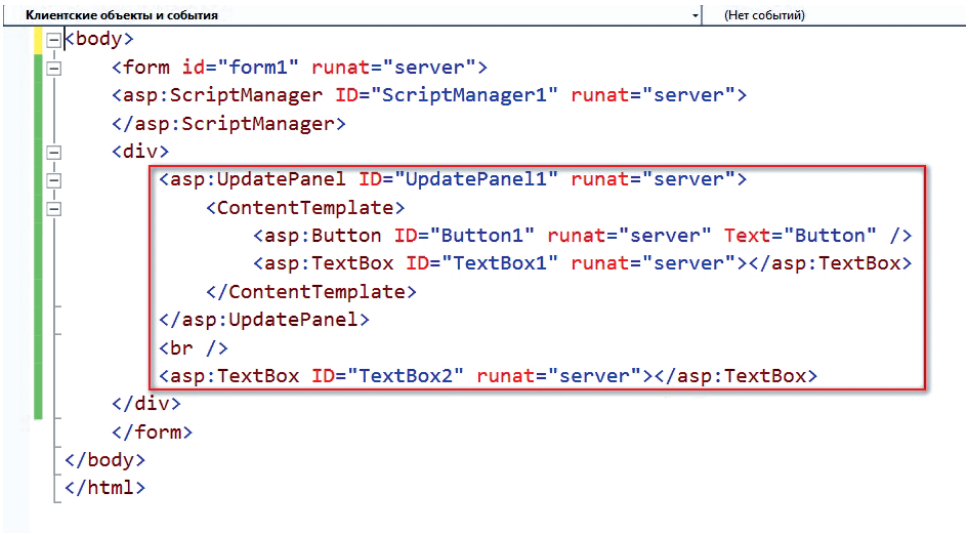

Fig. 3.15. Page markup

14. Run the project. Press the button for updating of text fields. If the button is pressed twice, it is possible to see a change of time in the first text field. But time in the second text field will remain the same. It occurs because of updating only those elements which are in "UpdatePanel1", without page reloading completely.

15. Add a new database to the project. Leave the name of the database by default as "Database1.mdf".

16. Create two tables in database. Give the following names to tables: "CarBrands" and "Models". The structure of tables is shown in figures 3.16 and 3.17.

17. Fill the tables with data (the table "CarBrands" — three lines, the table "Models" — ten lines).

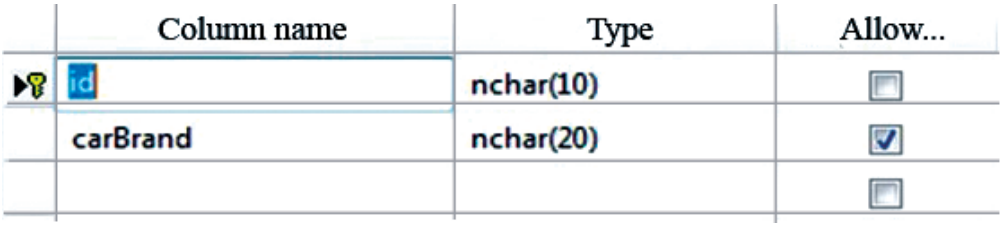

Fig. 3.16. Structure of the table "CarBrands"

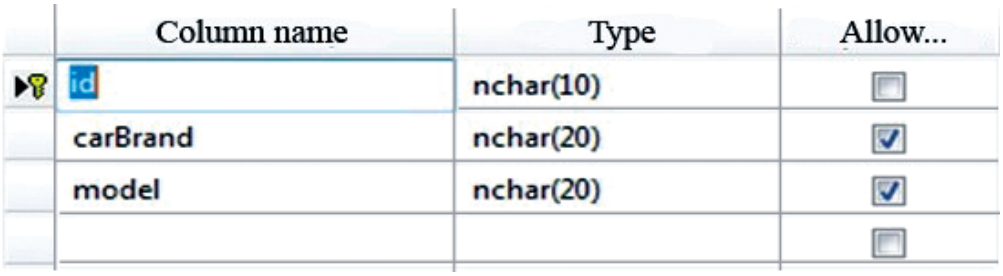

Fig. 3.17. Structure of the table "Models"

18. Switch to Design mode of the page.

19. Add on the page under the second text field two data sources of "SqlDataSource1" and "SqlDataSource2" ("Data" tab in "ToolBox").

20. Add on the page under data sources two "Label" controls, and also two "dropDownList" controls (view of the page in "Design mode" is shown on fig. 3.18).

21. Configure the "SqlDataSource1" for obtaining values of the brands of cars from the carBrand column of the table "CarBrands".

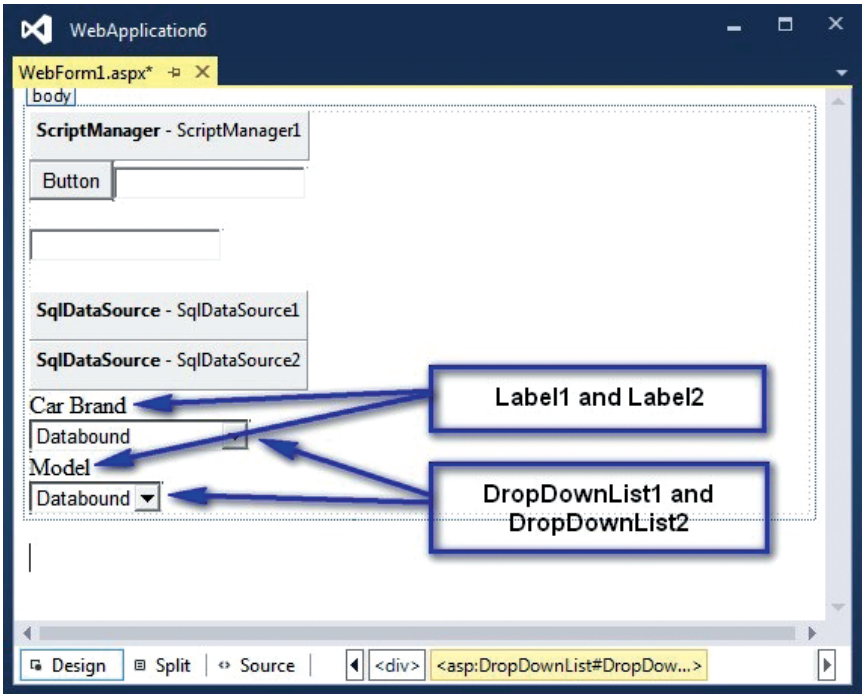

Fig. 3.18. Page markup in design mode

22. Configure the "SqlDataSource2" for obtaining values of models of cars from the model column of the table "Models". Set the "SqlDataSource2" condition "Where" as shown in fig. 3.19.

23. Set the "DropDownList1" property "autoPostBack" to "true".

24. Set data source of "SqlDataSource1" for the first "dropDownList".

25. Set data source of "SqlDataSource2" for the second "dropDownList".

26. Place "Label1", "Label2", "DropDownList1" and "DropDownList2" into control "UpdatePanel2". Add into "UpdatePanel2" control "ContentTemplate" (see item 13 and fig. 3.15). The markup for "UpdatePanel2" after modification is shown below.

```
<asp: UpdatePanel ID="UpdatePanel2" runat="server"
UpdateMode="Conditional"
      ChildrenAsTriggers="true">
      <ContentTemplate>
      <asp: Label ID="Label1" runat="server" Text="Car
Brand"></asp: Label>
      <br/>
            <asp: DropDownList ID="DropDownList1"
runat="server" AutoPostBack="True"
```

```
            DataSourceID="SqlDataSource1" DataTextField=
"carBrand" DataValueField="carBrand"
      </asp: DropDownList>
      <br/>
            <asp: Label ID="Label2" runat="server"
Text="Model"></asp: Label>
      <br/>
            <asp: DropDownList ID="DropDownList2"
runat="server" DataSourceID="SqlDataSource2"
            DataTextField="model" DataValueField="model">
      </asp: DropDownList>
</ContentTemplate>
<Triggers>
      <asp: AsyncPostBackTrigger ControlID="DropDownList1"/>
</Triggers>
</asp: UpdatePanel>
```

27. Run the project. Check the "dropDownLists" to see how they are working.

During the choice of brand of the car in "DropDownList1", "DropDownList2" is automatically updated and receives values of models of cars for the brand specified in "DropDownList1". Thus, complete reloading of the page doesn't happen.

However it is possible to notice that when choosing the brand in "DropDownList1" also updating of "TextBox1" occurs. To avoid this, it is necessary to specify explicitly, which controls will cause the updating of "UpdatePanel1" and "UpdatePanel2".

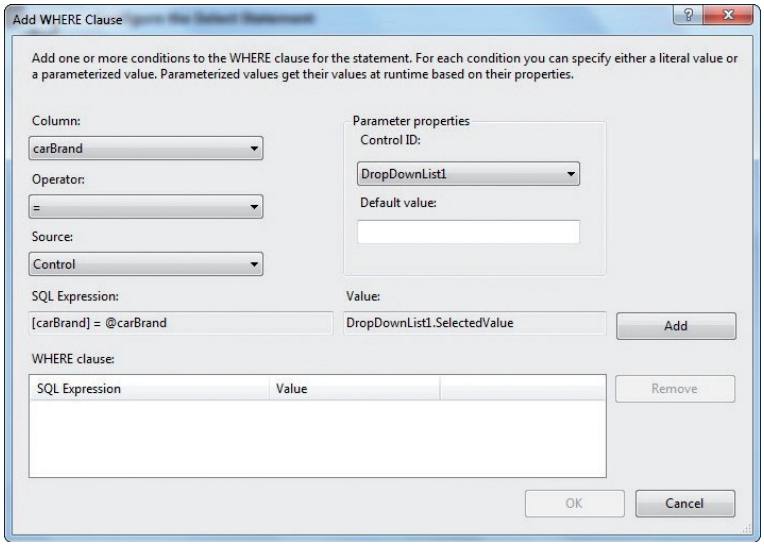

Fig. 3.19. Adding condition for "dropDownList1"

28. Switch to markup mode of the page.

29. Change markup for "UpdatePanel1". Add the "UpdateMode" attribute with value "Conditional" and the "ChildrenAsTriggers" attribute with value "true". Also specify "Button1" as the trigger for updating the "UpdatePanel1". The markup for "UpdatePanel" after modification is shown below.

```
<asp: UpdatePanel ID="UpdatePanel1" runat="server"
UpdateMode="Conditional" ChildrenAsTriggers="true">
<ContentTemplate>
<asp: Button ID="Button1" runat="server" Text="Button"/>
          <asp: TextBox ID="TextBox1" runat="server"></asp:
TextBox>
     </ContentTemplate>
     <Triggers>
          <asp: AsyncPostBackTrigger ControlID="Button1"/>
     </Triggers>
</asp: UpdatePanel>
```

30. Make the same operations for "UpdatePanel2". Specify "DropDownList1" as the trigger for updating of the "UpdatePanel2".

31. Run the project. Check the work of the "dropDownLists" and "button".

32. Switch to "Design mode" of the page.

33. Over the "TextBox2" element add control "Timer1" (it is in "Toolbox" in the Ajax-extensions tab).

34. Create the event handler "Timer_Tick" for "Timer1". For this purpose, make double click on the "Timer1" control.

35. Type the following code within event handler:

```
TextBox2.Text = DateTime.Now.ToLongTimeString ();
```

36. Switch to "Markup mode" of the page.

37. Place "Timer1" and "TextBox2" into control "UpdatePanel3".

38. Add to "UpdatePanel3" the "UpdateMode" attribute with value "Conditional" and the "ChildrenAsTriggers" attribute with value "true". Also specify "Timer1" as the trigger for updating of the "UpdatePanel3". The markup for "UpdatePanel3" after modification is shown below.

```
<asp: UpdatePanel ID="UpdatePanel3" runat="server"
UpdateMode="Conditional"
     ChildrenAsTriggers="true">
     <ContentTemplate>
          <asp: Timer ID="Timer1" runat="server"
OnTick="Timer1_Tick" Interval="1000">
```

```
            </asp: Timer>
            <asp: TextBox ID="TextBox2" runat="server">
            </asp: TextBox>
      </ContentTemplate>
      <Triggers>
            <asp: AsyncPostBackTrigger ControlID="Timer1"/>
      </Triggers>
</asp: UpdatePanel>
```

39. Set "Interval" property for the "Timer1" equal to "1000".

40. Run the project. The current time of the server will be displayed in "TextBox1". Updating of this field happens at an interval of 1000 milliseconds.

Self-study questions

1. How is it possible to tie a client script to Click event for the button?
2. For what purpose is element "UpdatePanel" used?
3. For what purpose is the <triggers> tag used in the markup to control "UpdatePanel"?
4. Explain the purpose of the "autoPostBack" property. What will happen, if "autoPostBack" property is set to "true"?

3.5. HTML markup. Table layout and block layout

Different approaches on creating of markup of the HTML page have their own advantages and disadvantages. Programmer needs to select by himself the one or the other kind of markup based on the objectives of the project.

There are two types of markup in HTML5: "table layout" and "block layout". "Table layout" is implemented by means of <table> tag. "Block layout" is created by means of tags.

Table layout — is quite convenient approach for markup of HTML page. In HTML you can create any quantity of rows and columns and then you can fill cells with different content. Cells of the table have its own settings of alignment unlike others elements. But in the same time table layout has some disadvantages. It is so called "rendering" of the page. While browser hasn't loaded closing tag of the table <table>, the user doesn't see the page content.

Tags are used for block layout. Programmer divides the page on certain quantity of blocks and positioning them on the page according to the project. Setting properties (for example, width, height, background color, font and etc.) is occurring in separate file of cascading style sheet (CSS file).

Farther let's consider examples of table layout and block layout.

3.5.1. Table layout

1. Create new empty web application.
2. Add to the project new web-form. The name of the web-form you can leave by default.
3. For creating markup of the page add between tags and following HTML code:

```
<table style="width: 80%; margin: auto; text-align: center;">
<!– First row of the table. Header of the site –>
<tr style="height: 70px;">
      <td colspan="2" style="height: 70px; background-color: yellow;">Header
      </td>
</tr>
<!– Second row of the table –>
<tr style="height: 400px;">
      <!– First column of the second row. Sidebar.
      <td style="width: 30%; background-color: red;">SideBar
      </td>
      <!– Second column. The area of main content –>
      <td>Content</td>
      </tr>
<!– Third row of the table. Footer –>
<tr style="height: 70px;">
      <td colspan="2" style="background-color: blue;">Footer
      </td>
</tr>
</table>
```

In the above code the page is divided on four main blocks: Header, Side Bar, Area of main content and Footer of site.

4. Run the project (Ctrl + F5).

3.5.2. Block layout

1. Create new project.
2. Add new web-form to the project. The name of the project you can leave by default.
3. For creating of markup of the page add between tags and the following HTML code:

```
<div>Header</div>
<div>SideBar</div>
<div>Content</div>
<div>Footer</div>
```

4. Farther add for every block the name of the class which will be used for setting properties of this block in CSS-file. Add additional block “Wrapper” which will allow us quite simple changing of parameters of the page.

```
<div class=”Wrapper”>
<div class=”Header”>Header</div>
<div class=”SideBar”>SideBar</div>
<div class=”Content”>Content</div>
<div class=”Footer”>Footer</div>
</div>
```

5. Right click of the name of the project.
6. Select item “Add”.
7. Farther select item “Create new element”.
8. In appeared window select item “Style Sheet”. Name of file you can leave by default.
9. Click “Add” button.

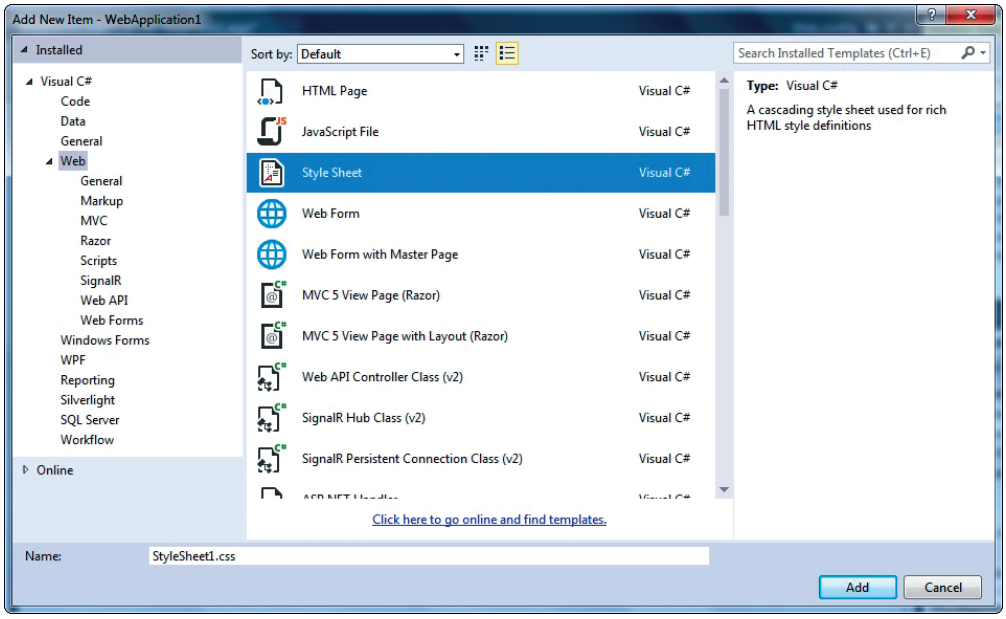

Fig. 3.20. Addin new item

10. Farther we need to add link on Style Sheet on our page. For this purpose it is necessary to add in block <head> the following HTML code:

```
<link rel="stylesheet" type="text/css" href="StyleSheet1.
css"/>
```

11. Switch to Style Sheet and add parameters of our blocks.

12. For block «Wrapper» add the following CSS-code:

```
.Wrapper {
margin: auto;
width: 80 %;
}
```

13. For block "Header" add the following CSS-code:

```
.Header {
Height: 70px;
width: 100 %;
background-color: yellow;
}
```

14. For block "SideBar" add the following CSS-code:

```
.SideBar {
width: 30 %;
height: 400px;
float: left;
background-color: red;
}
```

For block "SideBar" we need to set "float" property with value "left". This property allows you to paste a block to the left side of the parent element (the block in which it is located). If you do not set this property, then all blocks will be placed below each other in the so-called normal flow. The property "float" allows you to break the normal flow and place the block where it is necessary. Try to remove this property from your code and run the project again.

15. For block "Content" add the following CSS-code:

```
.Content {
height: 400px;
background-color: blue;
}
```

16. For block "Footer" add the following CSS-code:

```
.Footer {
height: 70px;
background-color: yellow;
}
```

17. Run the project (Ctrl + F5).

The above simple examples show the main points when creating table layout and the block layout. When selecting the type of layout, the programmer must determine which layout is most optimal for a specific type of project.

18. Try to make the following task.

Create page layout in two ways: table layout and block layout (fig. 3.21).

<table>
<tr><td colspan="4">Header</td></tr>
<tr><td>Main</td><td>News</td><td>About us</td><td>Contacts</td></tr>
<tr><td>HTML</td><td colspan="3" rowspan="5">Main content</td></tr>
<tr><td>CSS</td></tr>
<tr><td>ASP. Net</td></tr>
<tr><td>javaScript</td></tr>
<tr><td></td></tr>
<tr><td colspan="4">Footer</td></tr>
</table>

Fig. 3.21. Example of page layout

3.6. Work with data in ASP. Net. SqlDataSource. Data presentation by means of “GridView” and “Details View”

1. Create new empty ASP. Net application.

Add new Database to the project. For this purpose make the following steps:

2. Click on the name of the project in "Solution explorer".

3. Make the right click on the name of the project. In context menu select "Add item" → "Add new element".

4. In the opened window choose the "Data" tab from the left.

5. In the middle part of window select the "SQL Server Database" item (fig. 3.22).

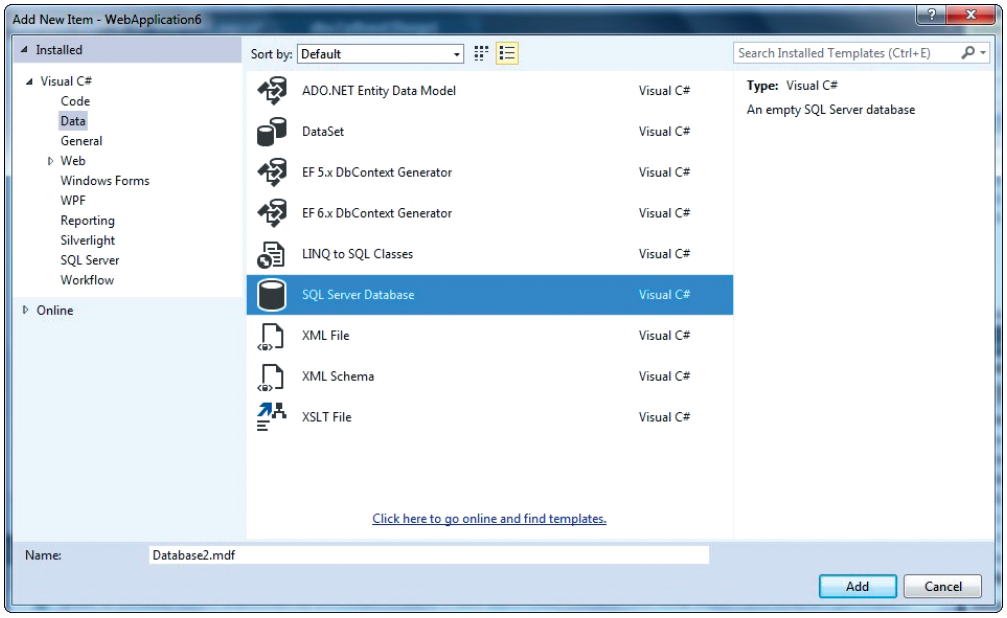

Fig. 3.22. Creating new Database

6. Leave the name of the file by default and press the Add button.

7. The program suggests you to create "App_Data" folder for storage of files of a database. Press "OK".

8. In "Solution explorer" make double click on the name of the Database. There will be window of "Server explorer" from the left, in which the created database and its structure will be visible.

9. In window of "Server explorer" make right-click on "Tables" and in context menu choose "Add new table". The designer of tables will open.

10. Define table columns as shown in fig. 3.23.

11. Change name of the table "Table" on "Persons" (SQL row: CREATE TABLE [dbo]. [Table]).

12. Set identity specification for "id" column (in properties window).

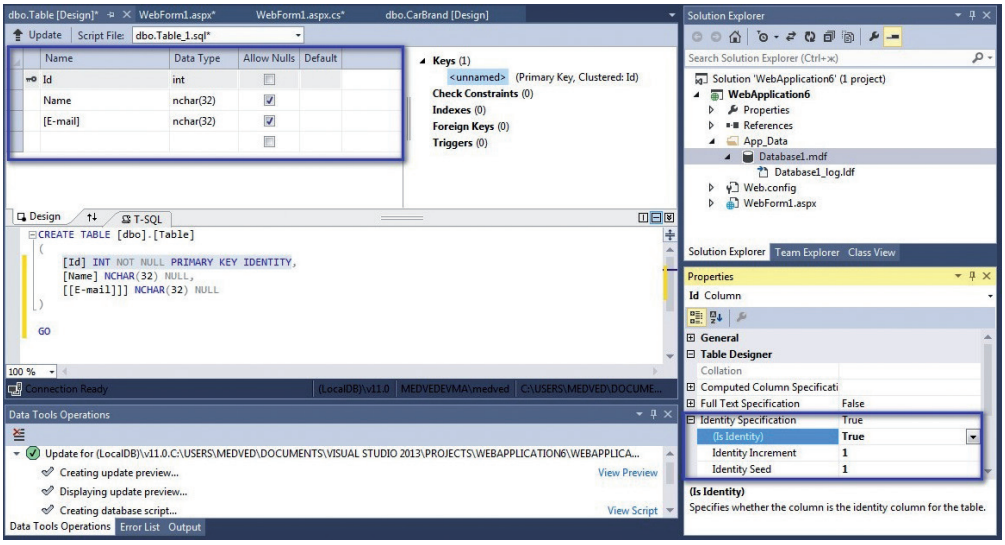

Fig. 3.23. Creating table «Persons»

13. Press the button “Update” to create table. Then press button “Update Database”. The program will save new table “Persons” in our Database.

14. Save the table as “Persons”.

15. Make right-click on the table “Persons” and in context menu select the “Show Table Data” item.

16. Fill in the table with data (3–4 lines). The first column carries out role of the counter and will be automatically filled.

17. Close the table.

> Further we will use the created Database in our application. We will bring data from Base to the web page and we will add opportunity for adding, editing, and deleting of data

18. Add new Web form to the project. Set the name on Web Form by default.

19. Switch to “Design mode” of the form.

20. Add on form new control “SqlDataSource” from “Toolbox” (drag by mouse control from the toolbox on the form). If the Toolbox isn’t opened, select the “View” item in the main menu and further press item “Toolbox”.

21. Click once by mouse “SqlDataSource1” on the form and press the button “>” (from the right of control).

22. Select “Configure Data Source” item.

23. In the appeared window select from the list "Database1.mdf" (or ConnectionString) and press "Next" button.

24. In the following also press "Next" button.

25. In the next window leave everything without changes (fig. 3.24) and press "Next" button.

26. In the following window press button "Done".

27. Click once data source "SqlDataSource1" on the form, press right arrow and then "Enter" button. The cursor will appear under control "SqlDataSource".

28. Add control "GridView" on the form (make double-click on this control in "Toolbox" or drag by mouse control on the form).

29. Set the data source "SqlDataSource1" for "GridView". For this purpose click once "GridView" by mouse and press button ">".

30. Select the data source "SqlDataSource1" from "dropDownList".

31. Set options "Include Sorting" and "Include Choice" for "GridView".

32. Run the project.

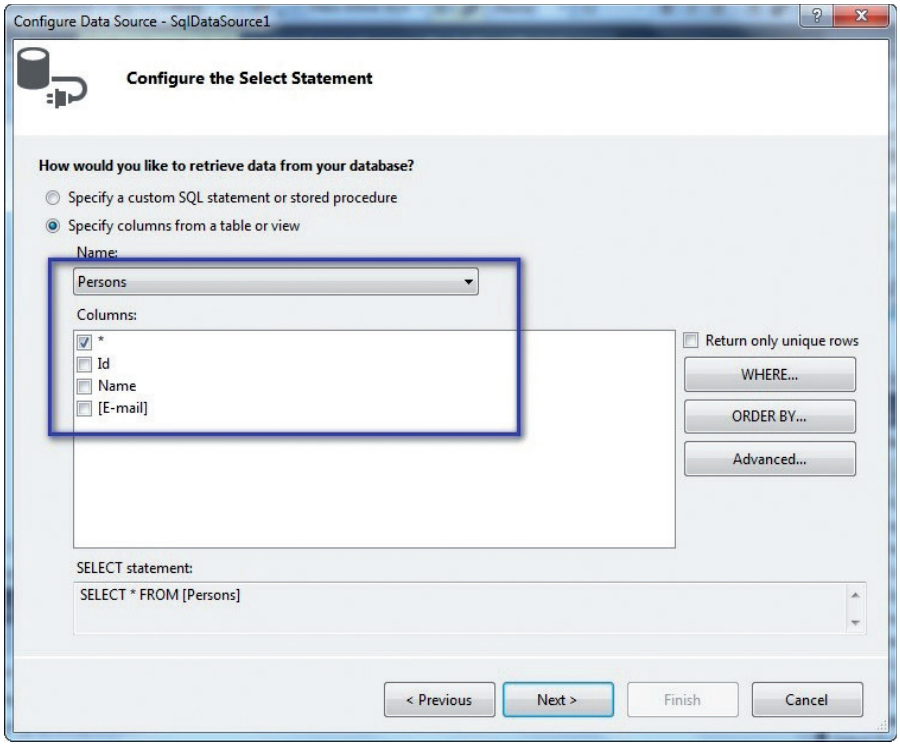

Fig. 3.24. Configuring of Data Source

33. Add one more data source of “SqlDataSource2” under “GridView” element.

34. Configure the data source similar to the first source. In the window “Configure the select statement” press “Where” button.

35. In the appeared window make settings according to fig. 3.25.

36. Press “Add” button.

37. Press «OK” button.

38. Press “Additionally” button.

39. Set the option “Create the Operators Insert, Update and Delete”.

40. Press button “OK”.

41. Press button “Next”.

42. Press button “Done”.

43. Add on the form under data source “SqlDataSource2” new control “DetailsView”.

44. Click once on the control “DetailsView” and press the button “>”.

45. In the appeared menu select data source “SqlDataSource2”.

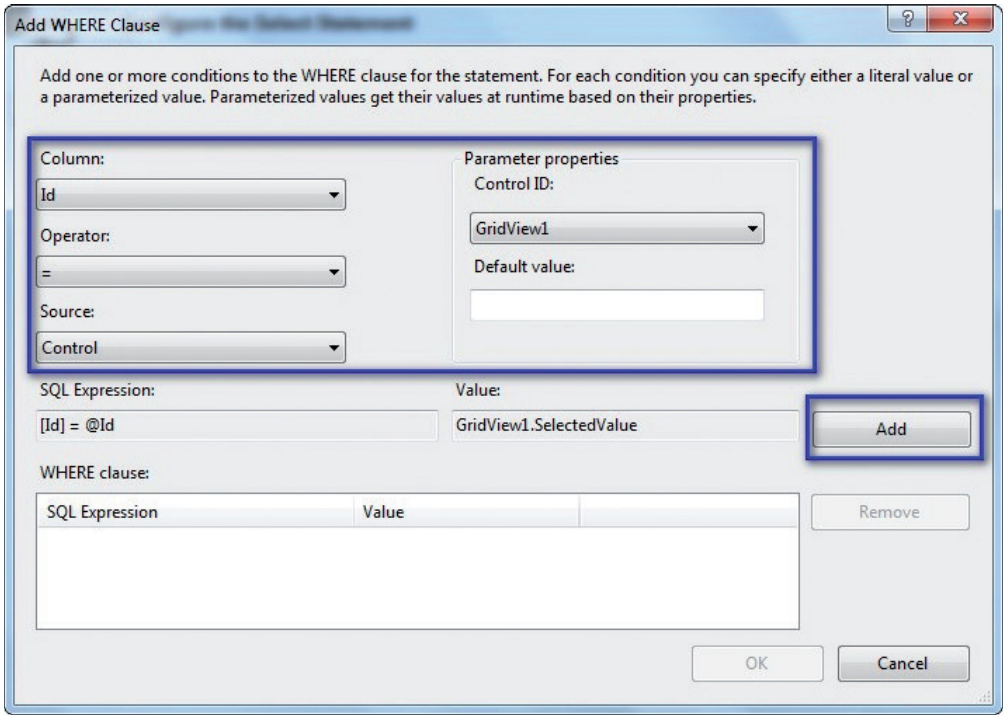

Fig. 3.25. Adding condition for SqlDataSource2

46. Set options "Include Inserting", "Include Editing" and "Include Removal".

47. Run the project.

Try to click any line, having pressed "Choice" button. There will be description of the chosen line below. Change data in any cell (press "Editing" button) and keep changes having pressed the Update button. Data in "DetailsView" are updated, but in "GridView" — are not updated. It occurs because event handlers for the operations Insert, Update and Delete aren't created in the project. We should create these event handlers.

48. Switch to "Design mode" of the form.

49. Select the element "DetailsView". Make right click and in context menu select "Properties" item. From the right of the main window the window of "Properties" will be opened.

50. In the "Properties" window switch to event tab (press an icon with drawing of a lightning (fig. 3.26)).

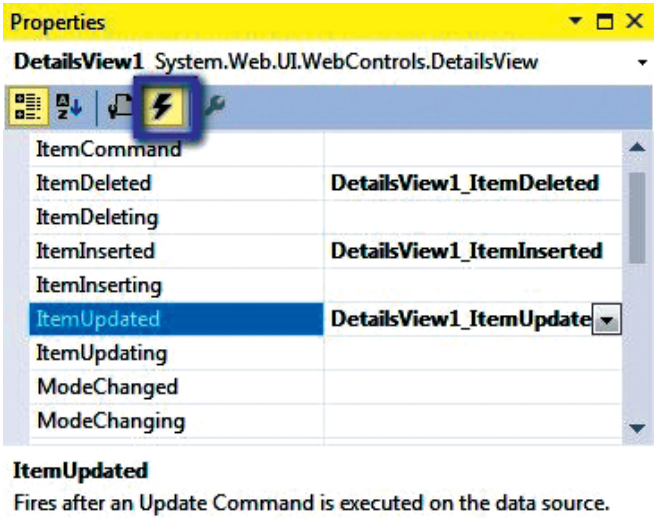

Fig. 3.26. Adding events for DetailsView1

51. Make double click on "ItemUpdated" event. The Visual Studio will automatically create the handler for this event.

52. Type the following code in the event handler:

```
GridView1.DataBind ();
```

Repeat actions from 49 to 50 for events "ItemDeleted" and "ItemInserted".

53. Run the project. Try to "Edit", "Insert" and "Delete" data from the DataBase.

Self-study questions

1. For what, in your opinion, the element "SqlDataSource" is used?
2. What information is displayed by element "GridView"?
3. For what purpose the element "DetailsView" is used? What operations can be made with data (in this laboratory work) by means of this element?

3.7. Work with data in ASP. Net. Use of the ADO. Net technology. Simple authentication of the user

ADO. NET represents a set of the libraries entering into Microsoft.NET Framework and intended for interaction with different data stores from.NET-applications. ADO. NET libraries include all necessary classes for connection to data sources of almost arbitrary format, execution of requests to these sources and receiving result.

Today ADO. NET is the most developed technology of data access among the technologies developed by Microsoft corp. It develops those principles which were underlain in such technologies as DAO and ADO, doing them by simpler in application, more powerful and the universal. At the same time ADO. NET is already other technology of data access.

We will consider architecture of ADO. NET. ADO. NET represents a set of classes for the organization of interaction of the client application with a database. We will consider an object model of ADO. NET.

In fig. 3.27 classes of creating an object model of ADO. NET are shown.

One of the main ideas which is the cornerstone of ADO. NET is the presence of suppliers of data.

The Supplier of data is a set of the classes intended for interaction with the data store of a certain type. At the expense of it the ADO. NET model is extremely flexible and expanded. We will consider levels of model of suppliers of ADO. NET (fig. 3.28).

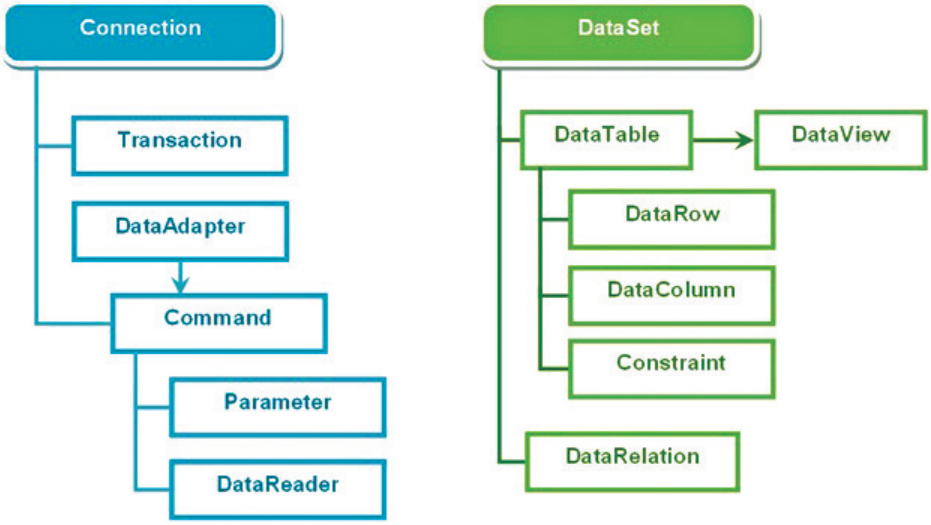

Fig. 3.27. Objects hierarchy in ADO. NET

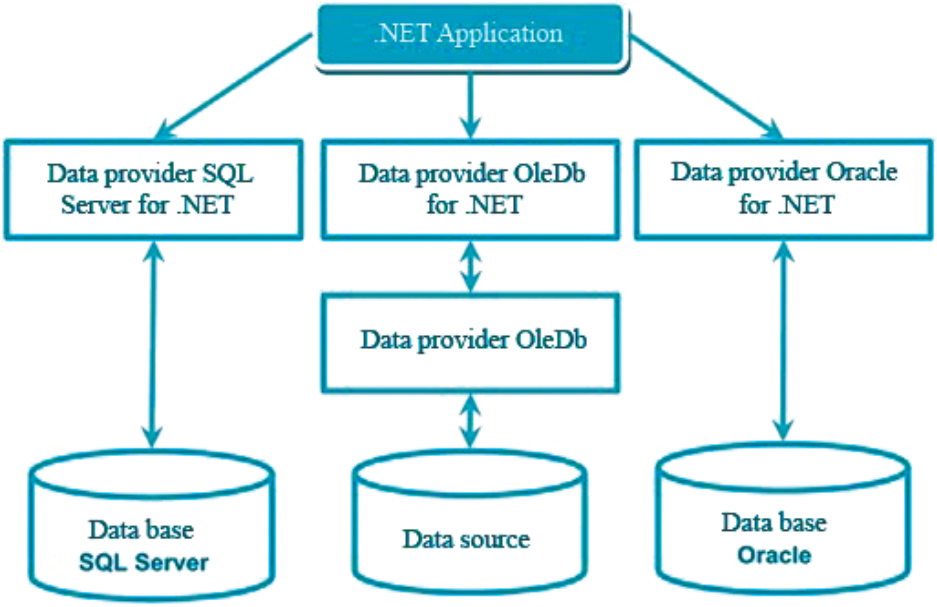

Fig. 3.28. Models levels of suppliers in ADO. NET

.NET application of interacts with a database by means of suppliers of data. Each supplier of data can provide access only to a database of a certain format. Those databases are one of the most widespread around the world therefore

suppliers of data for them are selected in separate elements of the ADO. NET model; nevertheless there is a set of databases of other format to which it is necessary to provide access from application of.NET. For this purpose data suppliers of OleDb for.NET or ODBC for.NET providing access to any data for which there is a driver OleDb or ODBC respectively can be applied.

Each supplier of.NET realizes identical base classes — Connection, Transaction, DataAdapter, Command, Parameter, DataReader, which names depend on the supplier. For example, the supplier of the SQL Server has an object of SqlDataAdapter, the supplier OleDb has OleDbDataAdapter etc.

Each supplier of data has its own name space. Though all suppliers use System.Data name space, each of them contains the subsection of this space which contains the objects specific to this supplier. For example, the object of SqlDataAdapter is in System.Data.SqlClient name space.

All suppliers of the data.NET realize identical basic functions therefore the code created for data access looks approximately equally irrespective of the supplier. It means that, considering use of interfaces of the certain supplier, we actually consider possibility of use of the same interfaces applicable and to other suppliers of data.

In the case of data access arrangement by means of ADO. NET the extremely important role is played by the following objects:

Connection object represents connection with data source. With its help it is possible to set data source type, its location, parameters of access and some other attributes. Before beginning interaction with data source, it is necessary to set connection to it by means of Connection object.

Command object represents request to data source; a call of stored procedure or direct request for return of contents of the specific table. It is known that there are some types of requests. Part of them is returned by the data derived from data source, others change records, the third — control the structure of a DB. By means of Command object it is possible to execute any of the listed types of requests. Distinctions in behavior of Command object start being shown when it is necessary to solve this or that query. So, for example, in need of execution of the request which isn't returning any record it is necessary to use the ExecuteNonQuery method of object of Command, and in case of extraction of data from a DB — the ExecuteReader method which, in turn, returns the object of DataReader allowing to view the records received as a result of request.

DataReader object is intended for the fastest selection and viewing of the records returned by request. However it allows to view all resultant record

set by relocation from one record to another and, thus, to view only one record for time. Besides, DataReader has no opportunity for updating of values of records and therefore can work in the mode "only for reading" at the expense of what possesses high performance.

Transaction object allows you to realize a group of records in a logical unit of the operation called by transaction. Transaction logically integrates some different actions connected to data manipulation in a whole. In the course of execution of the actions, which are realized within a transaction, the DBMS usually caches the changes made by these actions to the transactions until its completion. It allows to make canceling of any changes executed within transaction if at least one of actions of transaction came to the end unsuccessfully.

Parameter object allows you to enter an element whose value can be set just before execution of request into request. At the expense of its need every time to disappear and change the text of the request.

DataAdapter object represents a link between the disconnected objects of ADO. NET and a database. With its help filling of such objects as DataSet or DataTable, values received as a result of execution of database request for the subsequent independent operation with them is carried out. In addition, DataAdapter realizes an effective execution engine of up-dating of the data stored in a database, the changes made to dataset and DataTable.

*DataTable object a*llows viewing data in the form of record sets and columns. Actually, it represents the analog of table DB placed in memory. The advantage of such organization is possibility of independent operations on data. It means that after connection establishment with a database, data reading and fillings of object of DataTable with them it is possible to be disconnected from data source and to continue to work with it in a standalone mode. Such opportunity is extremely useful in case of the organization of Web applications which shall be well scalable and are oriented on a multi-user operation mode. Thus, however, there are also ghost effects one of which is connected to that the person working with an independent data set can't see the changes made to data at this moment by other users.

DataColumn object represents a column of object DataTable. The set of all poles of object DataTable represents the Columns collection. By means of this object it is possible to get access to cell value of the appropriate column.

DataRow object represents a line of object DataTable. Set of all lines of this object represents the Rows collection. DataRow is very often used for access to value of a specific field of a certain record. Thus Item property is applied.

DataSet object represents the disconnected data set, which can be consid-

ered as the container for a DataTable object. DataSet allows organizing in itself the structure which is completely corresponding to the real structure of tables and communications in between in a Database. It is convenient in that case when by operation with a database data from different tables are necessary. In this case instead of repeatedly addressing to the server and to select data from one table for time, it is possible to place all data in DataSet object, and then to transfer him to the client application. DataSet is very powerful tool for operation with the disconnected data sets. All changes which are made to the data, which are stored in DataSet are cached in DataRow objects. When there is a need of transmission of changes from DataSet in a DB, it is possible to realize transmission only of the changed data instead of transferring all data of object, and it considerably reduces data volume, transferred between the client computer and the server.

DataView object is intended for the organization of possibility of viewing the contents of DataTable by different methods. It belongs to such operations as sorting and filtering records. By means of DataView it is allowed to view contents of one DataTable objects with different installations of filtering and sorting. For this purpose it is necessary to use two different DataView objects connected to one object of DataTable. Such opportunity excludes need of storage of one data set for two different structures.

In more detail use of all objects of the ADO. NET model will be considered below.

1. Create a new empty ASP. Net application.

2. Add a new Database to the project. For this purpose do the following.

3. Click on the name of the project in the "Solution explorer".

4. Right click on the name of the project. In context menu select "Add item" → "Add existing element".

5. In the opened window choose the "Data" tab at the left.

6. In a middle part of a window select the "SQL Server Database" item (fig. 3.29).

7. Leave the name of the file as the default name and press "Add" button.

8. The program suggest you to create "App_Data" folder for storage of files of a database. Press "OK".

9. In "Solution Explorer" double click on the name of "Database1.mdf" Database. From the left, the "Server explorer" window will appear and this is where the created database and its structure will be visible.

10. In the "Server explorer" window make right click on "Tables" and in the context menu select "Add new table". The table designer will open.

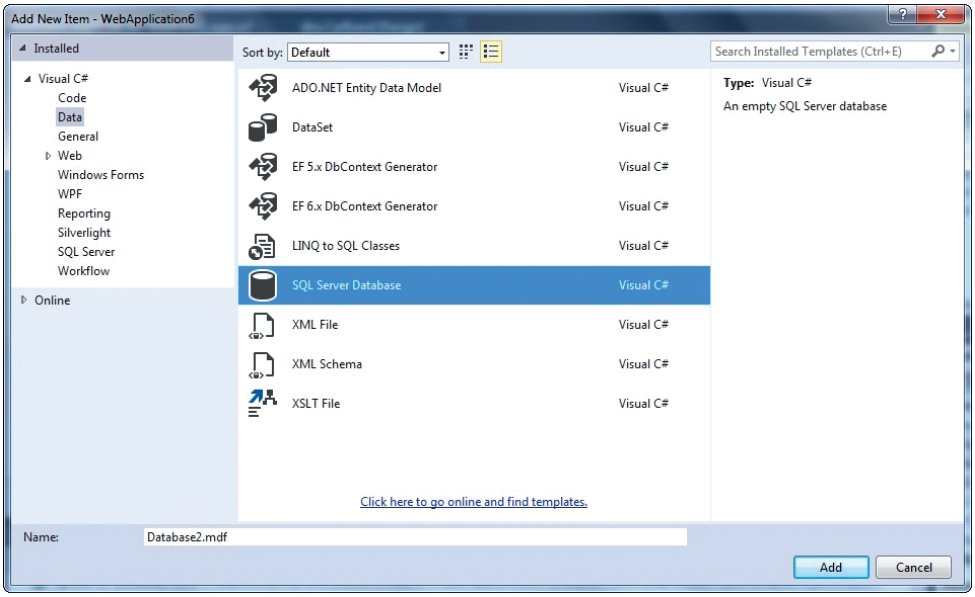

Fig. 3.29. Creating a new Database

28. Define table columns as shown on fig. 3.30.

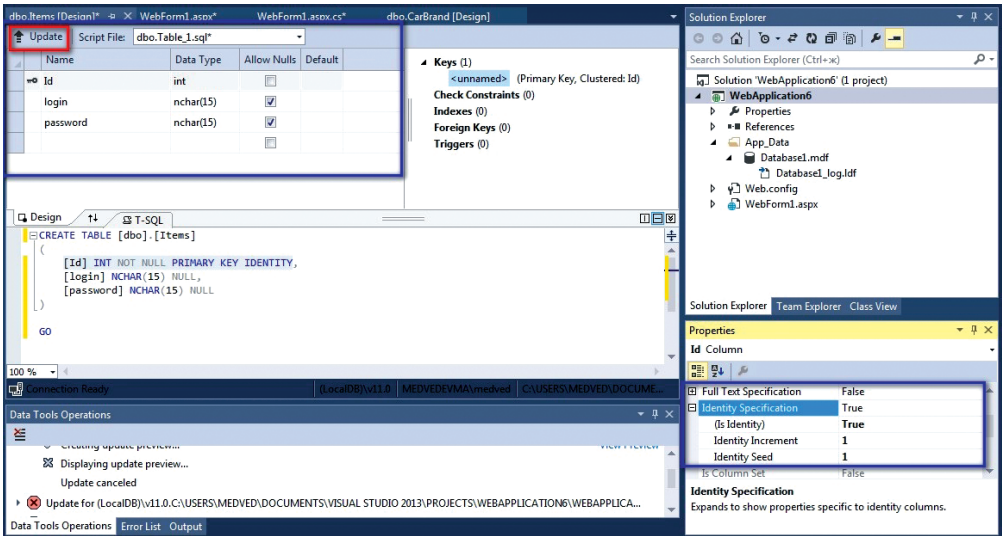

Fig. 3.30. Creating table «Items»

11. Change name of the table “Table” to “Items” (SQL row: CREATE TABLE [dbo]. [Table]).

12. Set identity specification for “id” column.

13. Press “Update” button to create the table. Then press “Update Database” button. The program will save new table “Items” in Database.

14. Make right click on the table “Items” and in context menu select “Show Table Data” item.

15. Fill in the table with data (3–4 lines). The first column carries out a role of the counter and will be automatically filled.

16. Close the table.

Further we use the created Database in our application for authentication of the user.

17. Add three new web forms to the project. Give to the first form the name — “Default.aspx”. To the second — “Admin.aspx”. Leave the name of the third form by default.

18. In “Default.aspx” file between the and tags place the following HTML markup:

```
<table style=”margin: auto; width: 210px; height: 100px;”>
<tr>
<td>
     <asp: Label ID=”Label1” runat=”server” Text=”Логин”
Font-Bold=”True”
                      Font-Size=»12pt»></asp: Label>
     </td>
     <td>
     <asp: TextBox ID=”TextBox1” runat=”server”></asp:
TextBox>
     /td>
</tr>
<tr>
     <td>
     <asp: Label ID=”Label2” runat=”server” Text=”Пароль”
Font-Bold=”True”
                      Font-Size=»12pt»></asp: Label>
     </td>
     <td>
     <asp: TextBox ID=”TextBox2” runat=”server”></asp:
TextBox>
</tr>
<tr>
     <td colspan=”2” align=”center”>
     <asp: Button ID=”Button1” runat=”server” Text=”Войти”
Width=”100px”
                      Font-Bold=»True» Font-Size=»12pt»/>
```

```
            <asp: Button ID="Button2" runat="server"
Text="Отправить" Width="100px"
                  Font-Bold=»True» Font-Size=»12pt»/>
      </td>
</tr>
</table>
<div style="text-align: center;">
      <asp: Label ID="Label3" runat="server"
Text="Label"></asp: Label>
</div>
```

The markup given above can be created in two ways:

1) Code can be entered from the keyboard;

2) We can drag necessary elements on form from "ToolBar" and set the specified properties.

19. In "WebForm1.aspx" file between the and tags place the following HTML markup:

```
<h1>You've entered site</h1>
```

20. In "Admin.aspx" file between the and tags place the following HTML markup:

```
<h1>Administrator's page</h1>
```

Further it is necessary to add some logic in "Default.aspx.cs" file (the event handler for "Enter" button). We will place C# code for processing of data entered by the user. For communication with a database we will use the ADO. Net technology.

21. Add to the project a new element "Data set" ("DataSet1.xsd").

22. After creating "Data set" drag the table "Items" into window of "Data set" (fig. 3.31).

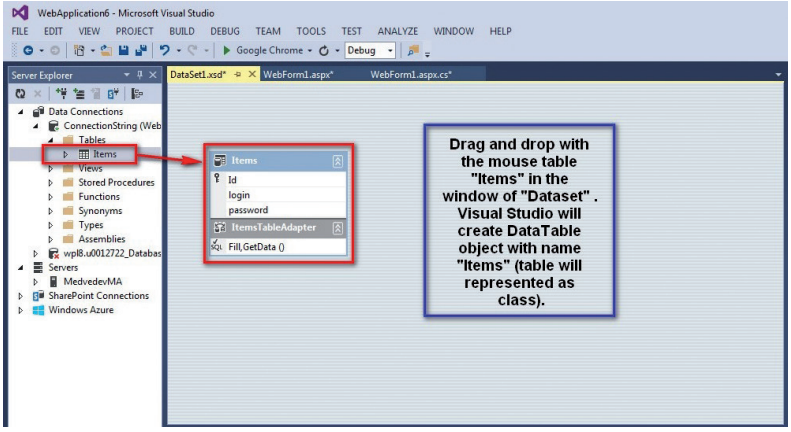

Fig. 3.31. Adding table "Items" to DataSet1

23. Save and close “DataSet1”.

24. Switch to “Design mode” of the Default.aspx form.

25. Make double click on “Enter” button. The Visual Studio will automatically open file of logic “Default.aspx.cs” and event handler of pressing the button will be created.

26. Add the directive “using System.Data.SqlClient;” in the top part of code.

27. Before the event handler “Button1_Click” add the following code:

```
SqlConnection con = new SqlConnection (@”ConnectionString “);
SqlCommand com = new SqlCommand ();
DataSet1 data = new DataSet1 ();
```

28. Instead of the words “ConnectionString” it is necessary to add name of connection that we used for our earlier created database. For this purpose, open the “Web.config” file (the file is in “Solution Explorer”). Find the section “ConnectionString”, copy the contents of “connectionString” property (without quotes) and insert instead of the words “ConnectionString” in the code of logic of the page.

29. In the “Page_Load” event handler add the following code:

```
TextBox1.ToolTip = “Enter login”;
TextBox2.ToolTip = “Enter password”;
Label3.Text = “”;
```

30. In the event handler “Button1_Click” add the following code:

```
try
{
      if (TextBox1.Text == “Admin” && TextBox2.Text == “Admin”)
      {
      Response.Redirect (“Admin.aspx”);
}
//Enter button
com.CommandText = “Select * From Items where login=’ “ +
TextBox1.Text + “ ‘ and password=’ “ + TextBox2.Text + “ ‘ “;
      com.Connection = con;
      con.Open ();
      SqlDataAdapter adp = new SqlDataAdapter (com.Command-
Text, con);
      adp.Fill (data, “Items”);
      var rowCount = data.Tables [“Items”].Rows.Count;

if (rowCount > 0)
```

```
{
      TextBox1.Text = "";
      TextBox2.Text = "";
      Response.Redirect ("WebForm1.aspx");
}
else
{
      TextBox1.Text = "";
      TextBox2.Text = "";
      Label3.Text = "Sorry, wrong login or password…";
}
}
finally
{
con.Close ();
}
```

31. Run the project.

32. Test the form. Try to enter right (or wrong) data and to press the "Enter" button.

33. Switch to "Design mode" for the Default.aspx form.

34. Make double click on "Send" button. The Visual Studio will automatically open file of logic Default.aspx.cs and event handler of pressing the button will be created.

35. In the event handler "Button2_Click" add the following code:

```
//Send button
com.CommandText = "";
SqlDataAdapter adp = new SqlDataAdapter (com.CommandText,
con);
Random rnd = new Random ();
data.EnforceConstraints = false;

try
{
com.CommandText = "Insert Into Items (id, login, password)
values (' " + rnd.Next (0,1000000) + " ',' " + TextBox1.
Text + " ', ' " + TextBox2.Text + " ')";
com.Connection = con;
con.Open ();
com.ExecuteNonQuery ();
Label3.Text = "Registration complited…";
TextBox1.Text = "";
```

```
TextBox2.Text = "";
}
finally
{
con.Close ();
}
```

36. Run the project.

37. Enter data into the fields "Login" and "Password" and press "Send" button.

38. Try to enter the website with login and password which were created earlier.

Self-study questions

1. What type of markup was used when creating the form for authentication?

2. How is the logic of checking the correctness of input data implemented in this learning task?

3. What SQL-command is used in logic of operation of "Send" button?

4. What method is used for the redirection of the user on the WebForm1.aspx when entering correct data?

3.8. Sending Email by means of C#

1. Open Visual Studio and Create a New "Empty ASP. NET application".

2. Add a New Page (Web Form).

3. Click on the Table Menu and select "Insert Table", and create a table with 4 rows and 2 columns (fig. 3.32).

4. Run your project (Ctrl + F5) to view your work in the browser.

5. Switch back to the project file and make double click on "Send" button to view the code-behind file (C# code).

Add these libraries in order for the Mail functionality to work. They must be added after the other library functions have been called.

```
using System.Net;
using System.Net.Mail;
```

6. Move to the "Button Click" event code and inside it, we would create the code for sending an email and link our text input from the form with the C# code.

```
MailMessage msg = new MailMessage ();
string name = Name.Text;
```

```
msg.From = new MailAddress ("EmailChecking@yandex.ru");
msg.To.Add ("EmailChecking@yandex.ru");
msg.Subject = Subject.Text;
msg.Body = "Message from "+name+": "+ Message.Text;
```

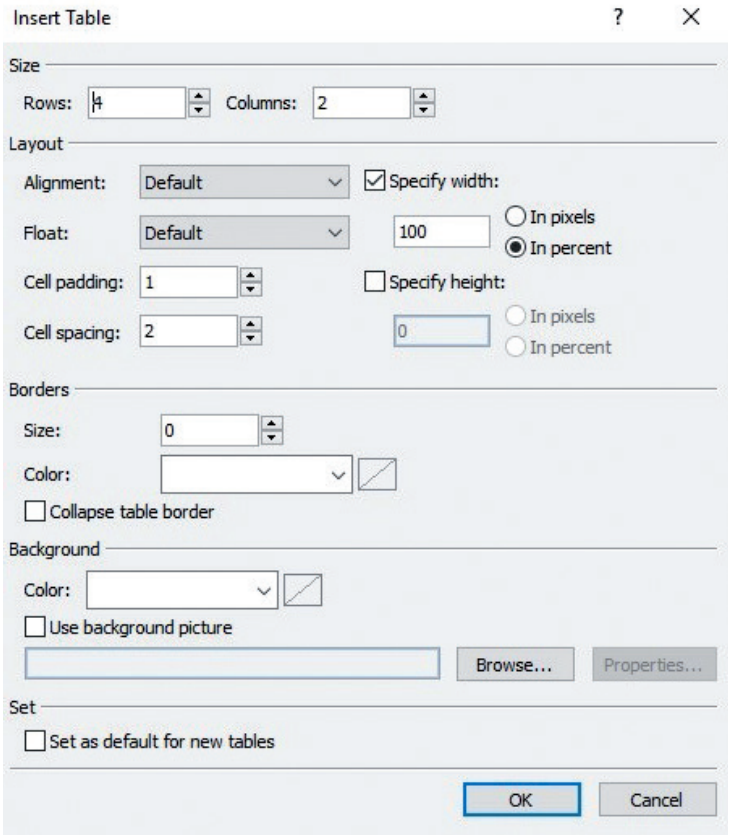

Fig. 3.32. Inserting table on the page

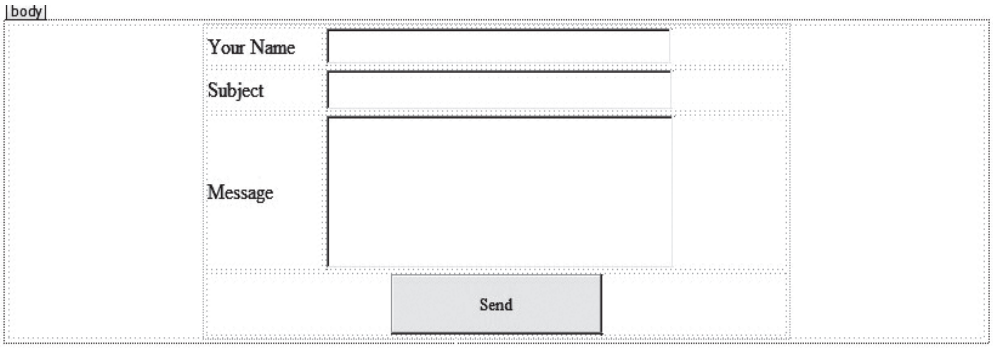

Fig. 3.33. Layout of the page in design mode

Next step we will place the following code below the above one. We want to use the Yandex protocol to send our emails.

```
  SmtpClient sc = new SmtpClient ("smtp.yandex.ru");
  sc.Port = 25;
  sc.Credentials =
  new NetworkCredential ("emailchecking@yandex.ru",
"123checking");
  sc.EnableSsl = true;
  sc.Send (msg);
```

10. Now we would use the Try... Catch functionality to help us detect errors if our email doesn't go through.

Place all the code in the try section. As seen below:

```
protected void Send_Click (object sender, EventArgs e)
      {
            try
                  {
            MailMessage msg = new MailMessage ();
            string name = Name.Text;
            msg.From = new MailAddress ("EmailChecking@yan-
dex.ru");
            msg.To.Add ("EmailChecking@yandex.ru");
            msg.Subject = Subject.Text;
            msg.Body = "Message from "+name+": "+ Message.
Text;
            SmtpClient sc = new SmtpClient ("smtp.yandex.ru");
            sc.Port = 25;
      sc.Credentials = new NetworkCredential ("emailcheck-
ing@yandex.ru", "123checking");
            sc.EnableSsl = true;
            sc.Send (msg);
            Response.Write ("Mail Sent");

            }

catch (Exception ex)
            {
            Response.Write (ex.Message);
      }
}
```

8. Go to "Design mode" of the page and run the project.

3.9. Ajax-extensions. Calculator by means of UpdatePanel

1. Open Visual Studio and create a new “Empty ASP. NET application”.
2. Add a New Page (Web Form).
3. Add the control “ScriptManager” into the “form” tag of page (using the “Toolbar” from the Ajax-extensions tab).
4. Insert an HTML header of your choice below the script manager (eg. <h1>Calculator</h1>).
5. Let’s add the “Update Panel” and insert two “textbox” controls and “labels” into it and add a button control (with the text “Calculate”). Also, give each “textbox” different ID’s (basic salary, hours) (as seen below in fig. 3.34).

```
<form id="form1" runat="server">
<div>
    <asp:ScriptManager ID="ScriptManager1" runat="server"></asp:ScriptManager>

    <h2>Salary Calculator</h2>
    <asp:UpdatePanel ID="UpdatePanel1" runat="server" UpdateMode="Conditional">
        <ContentTemplate>
            <asp:Label runat="server" Text="Basic Salary"></asp:Label>
            <asp:TextBox runat="server" ID="salary"></asp:TextBox>

            <br />

            <asp:Label runat="server" Text="Hours Worked"></asp:Label>
            <asp:TextBox runat="server" ID="hours"></asp:TextBox>

            <br /><br />

            <asp:Button ID="calculate" runat="server" Text="Calculate" />
        </ContentTemplate>

        <Triggers></Triggers>

    </asp:UpdatePanel>
</div>
</form>
```

Fig. 3.34. HTML code of the page

6. In the “Update panel”, set the “UpdateMode” equal to “Conditional”.
7. Run the project to view the changes made.
8. Switch to “Design Mode”.
9. Add 2 “Label” controls below the “Button”. The first one must contain the Text = “Your Salary is = ”.

The second label must have an ID set to “total” and the “Text” portion empty. Set the “Visibility” property for both to “false” (Visible=”false”). As seen below.

```
  <br/><br/>
  <asp: Label ID=”Label1” runat=”server” Text=”Your Sala-
ry is = "Visible="false"></asp: Label>
  <asp: Label ID="total" runat="server" Text=""
Visible="false"></asp: Label>
```

10. Double click the button to go to the code-behind (C# code). In the Button event code:

10.1. First create a variable, amount — related to the salary textbox & time — related to the hours textbox.

10.2. In order for our input to be calculable, we need to change their format from the default strings to double or integer values. So we use the “double.Parse” (the ID of the “textbox. Text”).

10.3. Also create a variable for storing the product of the amount and time variables (“total_salary”).

We will then have to change the value of the “total_salary” variable to a “String” item so it can be readable on our webpage.

Finally, set the value of our labels to “true” (As seen in the code below).

```
  protected void calculate_Click (object sender, EventArgs e)
  {
     double amount = double.Parse (salary.Text);
     double time = double.Parse (hours.Text);
     double total_salary = amount * time;
     total.Text = total_salary.ToString ();
     total.Visible = true;
     Label1.Visible = true;
  }
```

11. Go to the.aspx file with our AJAX/HTML code and run the project. Input values and test the program.

12. Switch to “Markup Mode” and add another button under the “Calculate” button. Give the new button ID = “reset” and “Text” = “Reset”.

13. Switch to “Design Mode” and make double click on the New Button (Reset). In the C# code area we want to set everything back to normal after we have done our calculation.

```
  protected void reset_Click (object sender, EventArgs e)
  {
     total.Visible = false;
     Label1.Visible = false;
     salary.Text = “”;
     hours.Text = “”;
  }
```

23. Switch back to the "Design Mode" and run the project. Test the changes made. We realize that there's no visible sign of the page reloading in order to perform any of the functions.

3.10. Creation of a simple site ASP. Net

Students are offered to create the simple site on the ASP. Net technology with the use of the MS Visual Studio environment. Requirements to the website are provided below:

1. Number of pages of the site — 5.
2. Technologies have to be used: HTML, CSS, and JavaScript.
3. Existence of one DB of SQL Server (database).
4. Processing of requests for the server with use of the C# language (for example, the page of an entrance on the site or authorization on the main page, check of login and the password).
5. Site layout: Block layout (using Divs).
6. Existence of the Contacts page and feedback (sending e-mail from the site).
7. Existence of the horizontal and vertical menu.
8. In a website header existence of the Figture link (it is possible on an external resource).
9. Existence of not less than two JavaScript (one can be taken from ready templates, but the second must be self-written).
10. Existence of an image Slider on the main page.
11. Existence of animation for any element on the page (using jQuery).
12. Existence of various content: some Figtures, one video file (any), some paragraphs of the text.

Ready website runs on localhost.

One of the sites written by the students will be deployed on a real domain.

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